BLUMEA

Vol. V, No. 1, blz. 1—280. 15. VI. 1942.

Uitgegeven door het } Rijksherbarium,
Published by the } Leiden, Nederland.

A TENTATIVE LIST OF WILD PACIFIC SAPOTACEAE, EXCEPT THOSE FROM NEW CALEDONIA

by

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(Issued June 15th, 1942).

Several years ago the Director of the Bernice P. Bishop Museum, Honolulu, was kind enough to lend me the Sapotaceous material from the Pacific region preserved in its Herbarium. It has been enumerated underneath together with additional material from other herbaria. These have been quoted by means of the following abbreviations, which are taken from Lanjouw's list, published in Chronica Botanica V, 1932, 142.

A. = Arnold Arboretum of Harvard University, Jamaica Plain (Mass.), U. S. A.
B. = Botanisches Museum, Berlin-Dahlem.
Bish. = Bernice P. Bish. Museum, Honolulu, Hawaiian Isl. and some specimens from the private herbarium of Mr O. Degener.
Bz. = Herbarium, Gov. Botanic Gardens, Buitenzorg, Java.
Cal. = California Botanical Gardens, San Francisco.
G. = Institut de Botanique systématique de l'Université de Genève.
GB. = Botanical Garden, Göteborg.
GH. = Gray Herbarium of Harvard University, Cambridge (Mass.), U. S. A.
K. = Royal Botanic Gardens, Kew.
L. = Rijksherbarium, Leiden.
NY. = New York Botanical Garden, New York.
O. = Universitetets Botaniske Museum, Oslo.
P. = Muséum National d'Histoire Naturelle, Lab. de Phanérogamie, Paris.
PRC. = Botanical Institute, Charles University, Praha.

Besides, a number of the specimens quoted are probably represented in other, particularly American herbaria, of which no data were available. I wish to tender my sincere thanks to the directors of the institutions mentioned for their kind assistance.

The present list only comprises wild species from the islands east of Formosa, the Philippines, New Guinea and New Caledonia. It is intended as a working basis for further studies, as some points could not be cleared up on account of lack of material and particularly of type

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1) The MS. of the present paper was about to be forwarded to the director of the B. P. Bishop Museum, Honolulu, to be presented for publication in one of the Series of that Museum, when the Japanese-American war broke out. As this prevented us from following our original intention, the paper is now published in "Blumea".

specimens. For practical purposes I added keys to the genera and to the species. In a very concise form it has been added as an Appendix to a paper on the distribution of the Sapotaceae in the Pacific Region, read before the Sixth Pacific Science Congress, held at Berkeley, Cal., in 1939 and due to be published in the Proceedings of that Congress. Some of the genera (*Nesoluma, Manilkara* and *Northiopsis*), which have been circumstantially dealt with in recent papers, have been treated in a concise way here.

For some parts of this investigation I enjoyed the assistance of the following gentlemen: Mr. B. J. D. Meeuse (*Planchonella*), Mr. J. E. Boeke (*Planchonella sandwicensis*) and Mr. E. van Olden (*Burckella*).

Key to the genera.

1a. Sepals fundamentally arranged in a spiral, mostly 5 or 4, sometimes 6 or even 3, never arranged in two distinct alternate whorls of sepals of the same size . 2
b. Sepals in two whorls of 2 sepals . . . . IV. **Burckella**
c. Sepals in two whorls of 3 sepals 3
d. Sepals in two whorls of 4 sepals . . . . VII. **Mimusops**
2a. Sepals (4—)5, about equal in size or the inner ones smaller, petals as many as are the epipetalous stamens and the alternipetalous staminodes; the two latter categories may, however, be wanting. Tertiary nervation transverse or parallel to the secondary nerves; seed with a long and narrow ventral scar. Genus widely spread in East Asia, Malaysia and the Pacific. I. **Planchonella**
b. Sepals 4 or 5, more rarely 6 or 3, always unequal in size, the outer ones smaller; petals (4—)8—10(—12), sometimes reduced or wanting, stamens about as many or some of them replaced by petaloid staminodes. Tertiary nervation minutely reticulate; seed with a relatively large, almost circular and basal or basiventral scar. Hawaiian Islands, Tahiti, Tuamotu Islands, Austral Islands . II. **Nesoluma**
3a. Staminodes wanting; stamens twice of thrice the number of the petals or even more . . . . III. **Palaquium**
b. Alternipetalous staminodes extant; stamens as many as petals and opposite them 4
4a. Dorsal appendages to the petals extant . . . . V. **Manilkara**
b. Dorsal appendages to the petals wanting[1] . . . . . VI. **Northiopsis**

For general information about the genera I may refer to the following previous publications, which have not been mentioned under the genera separately:

LAM, H. J., The Sapotaceae of the Dutch East Indies, etc. — Bull. Jard. bot. Buitenz. Sér. III, 7, 1925, 1—289.

——, Further studies on Malayan Sapotaceae — Ibid. 8, 1927, 381—493.

——, Enumeration of the Sapotaceae thusfar known from New Guinea — Nova Guinea XIV, 4, 1932, 549—570.

——, Phylogeny of single features — Gard. Bull. Str. Settlem. IX, 1, 1935, 98—112.

I. Planchonella Pierre.

1a. Tertiary nervation of the leaves (between the secondary nerves) transverse . 2
b. Tertiary nervation in general parallel to the secondary nerves or at least not distinctly transverse 5

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[1] Also in *Achras* (of which *Achras Zapota* L. is frequently cultivated), but here the fruits are large and fleshy and the seeds are much flattened and with a long and narrow scar.

2a. Leaves very rigidly coriaceous 3
b. Leaves chartaceous or membranous, not very rigid 4
3a. Leaves lanceolate to oblong, base acute or cuneate, apex acute or shortly acuminate; petioles 2—3 cm long . . . . **2. P. firma**
b. Leaves oblong or ovate, base broad, subabruptly narrowed, apex more or less rounded or shortly and bluntly acuminate; petioles 3.5—5.5 cm long . . . . **5. P. macropoda**
4a. Leaves conferted at the tips of the branchlets, membranous; fruit subglobular, 3—5-seeded . . . . **6. P. membranacea**
b. Leaves scattered along the branchlets, chartaceous; fruit 1—2-seeded, oblong; staminodes with a broadly triangular base, acuminate, rarely ribbon-shaped . . . . **11. P. torricellensis**
5a. Leaves generally with an acute or acuminate apex; leaves oblong, ovate, elliptic or lanceolate [1]; fruits often more or less furrowed 6
b. Leaf-apex usually rounded and broad; leaves mostly obovate 9
6a. Leaves large, 12—30 cm long, 5—11 cm broad, elliptic to oblong, acuminate at tip; fruits up to 1.5 cm long 7
b. Leaves smaller, ovate or lanceolate, 4—12(—16) cm long, 1.5—4.5(—6.5) cm broad 8
7a. Tertiary nervation distinctly parallel to the secondary nerves; leaves large, up to 30 × 11 cm, petioles 3—5 cm; pedicels in flower 0.5 cm long . . . . **7. P. micronesica**
b Tertiary nervation not distinctly parallel to the secondary nerves, more or less transverse; leaves smaller, up to 22 × 7.5 cm, petioles 1 cm; pedicels in fruit 0.3—0.5 cm . . . . **6. P. membranacea**
8a. Fruit small, 1—1.5 cm long, ovoid, furrowed (unless rarely one-seeded), with thin pericarp; staminodes subulate or ribbon-shaped . . . . **9. P. oxyedra**
b. Fruit small, up to 1.5 cm long, not furrowed; staminodes with broad base and long acumen; leaves often tomentose underneath . . . . . **8. P. obovata**
c. Fruit larger, globular or ovoid, 2.5—3 cm long, 2—3 cm in diam., pericarp thick . . . . **3. P. Garberi**
9a. Leaves spathulate, narrow, 4.5—8 × 1.3—3 cm, almost sessile, secondary nerves 6—8, angle 35°—50°; fruit ovoid, with acute apex and persistent style, pedicels 0.3—0.4 cm long . . . . **4. P. Guillauminii**
b. Leaves usually larger or at any rate distinctly petioled; nerves more numerous, their angle larger 10
10a. Secondary nerves distinctly more conspicuous than the tertiary ones, which are longitudinally reticulate and never as straight as the secondary ones . 11
b. Secondary nerves hardly or not more conspicuous than the tertiary ones, which are as straight as (or almost so) and strictly parallel to the secondary nerves 12
11a. Fruits small, ovoid or obovoid, rarely more or less globular, always with rounded apex, up to 1.5 cm long and 1 cm in diam., 1—2(—3)-seeded; staminodes very variable but always broad at base and with a long protracted acumen; very polymorphous species . . . . **8. P. obovata**
b. Fruits larger, mostly globular and 4—5-seeded, more rarely 1—2-seeded and then oblong or obovoid, 2—3 cm long, 2—2.5 cm in diam.; staminodes ribbon-shaped or subulate . . . . **1. P. costata**
12a. Staminodes ribbon-shaped or subulate; fruits globular or oblong, 2—3 × 2—2.5 cm . . . . **1. P. costata**
b. Staminodes broad, often petaloid, ovate-elliptic with rounded or subacute tip but never acuminate; fruits very variable, ovoid and beaked to globular or pyriform or obpyriform, 1.5—5 × 1.1—3.5 cm . . . . **10. P. sandwicensis**

The Pacific *Planchonella*'s are extremely closely related mutually. Yet, four groups may be distinguished, viz.

I. the obovata-group, comprising first of all *P. obovata* (Seychelles to Solomon Isl.), *P. costata* (S. and S.E. Pacific) and *P. sandwicensis*

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[1] *P. obovata, sandwicensis* and *Guillauminii* may occasionally have more or less acute leaves; they have, however, to be sought under 5b.

(Hawaiian Isl.). These three species, all of them extremely polymorphous, (and possibly also *P. australis* from Australia) seem to be vicariants in a way; they are characteristic sea-shore trees (except *sandwicensis*) as well as trees of the interior up to about 1000 m alt., and they can only be separated on account of a combination of features. Homologous variations are frequent in many characters. In *P. costata,* var. *austromontana* the nervation is very much like that of *P. sandwicensis,* which is mainly a mountain type.

Some other species with smaller areas and slightly different type, arrange themselves around this central group, viz. *P. micronesica* (Caroline Isl.), *P. membranacea* (Fiji) and *P. Guillauminii* (New Hebrides).

In its general type (nervation) group I is more or less connected with the groups II and III.

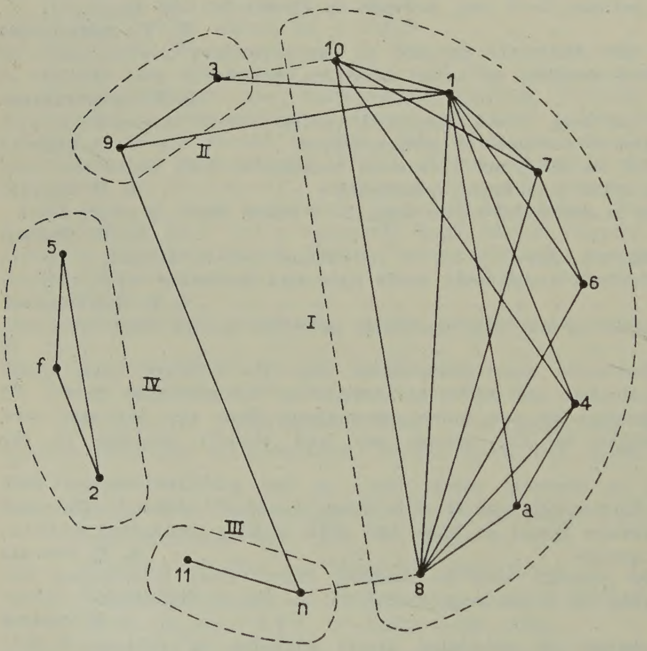

Fig. 1 — Relations of Pacific *Planchonella*-species.

1. costata
2. firma
3. Garberi
4. Guillauminii
5. macropoda
6. membranacea
7. micronesica
8. obovata
9. oxyedra
10. sandwicensis
11. torricellensis

a. australis
f. a group of New Guinea species of the firma-group
n. nitida

II. the oxyedra-group, comprising *P. oxyedra* (Malaya to Tonga), which is only variable in some characters and seems particularly related to *P. costata,* being distinguished by its acute leaves and small fruits; and *P. Garberi* (Fiji, Samoa), which is possibly only a large fruited form of *oxyedra.*

III. the nitida-group, comprising *P. nitida* (Bl.) Dub. (India to Celebes and the Philippines) and *P. torricellensis* (New Guinea and Samoa); also *P. laurifolia* (Rich.) Pierre from Australia.

IV. the firma-group is the only more separate group of species (§ *Pierriplanchonella* Dub., to which *P. nitida* forms a transition), comprising *P. firma* (Malaya to Moluccas), with some related species in the Philippines, viz. *P. fragans* (Elm.) H. J. Lam and *P. Foxworthyi* (Elm.) H. J. Lam, and in the Moluccas, viz. *P. moluccana* (Burck) H. J. Lam, *P. macropoda* (New Guinea and Solomon Isl.) and a number of endemic species in New Guinea (*P. monticola* [Krause] H. J. Lam, *P. nebulicola* H. J. Lam, *P. sussu* [Engl.] H. J. Lam and *P. lamprophylla* [Krause] H. J. Lam).

Fig. 1 shows the relationships of the species mentioned.

1. **P. costata** (Endlicher) Pierre in schedula Herb. Par. — *Achras costata* Endl., Prodr. Fl. Norf. 1833, 49 and Icon. Gen. Pl. 1838 t. 83 — *Sapota costata* (Endl.) A. DC. in DC., Prodr. VIII, 1844, 175; Hooker f., Fl. Nov. Zel. I, 1853—1855, 174; Hooker & Thomson, Handb. New Zeal. Flora 1867, 186 — *Sapota? Vitiensis* A. Gray, Am. Acad. V, 1862, 328 — *Achras Novo-Zelandica* F. v. Muell., Fragm. Phytogr. Austr. IX, 1875, 72 — *Sideroxylon costatum* (A. DC.) Benth. & Hook. f., Gen. Pl. II, 2, 1876, 655; Engler in Engl. Bot. Jahrb. 12, 1890, 518 and in Engl. & Prantl, Nat. Pfl. Fam. IV, 1, 1897, 144 — *Sideroxylon vitiense* (Gray) Benth. & Hook. f., Gen. Pl. II, 2, 1876, 655; Drake del Castillo, Ill. Fl. Ins. Mar. Pac. 1892, 229 — *Sideroxylon costatum* (Endl.) F. v. Muell., Syst. Census Austr. Pl. I, 1882; Kirk, For. Fl. New Zeal. 1889, 279, t. 133; Cheeseman, Man. New Zeal. Fl. 1906, 435 — *Sideroxylon tahitense* Nadeaud, Morot's Journ. de Bot. XI, 1897, 111 — *Sideroxylon vitiense* (Gray) Burkill, Journ. Linn. Soc. Lond. 35, 1901, 44 — *Planchonella tahitensis* (Nad.) Dubard, Ann. Mus. Col. Mars. 20, 1912, 50 — *Hormogyne tahitensis* Nadeaud in Dubard, Ann. Mus. Col. Mars. 20, 1912, 50 as a synonym sub *Planchonella tahitensis* — *Sersalisia costata* (Endl.) Domin, Bibl. Bot. 89, 1928, 508 — *Lucuma vitiensis* (Gray) Gillespie, B. P. Bish. Mus. Bull. 74, 1930, 12, fig. 14 — *Sideroxylon* spec. Wilder, B. P. Bish. Mus. Bull. 86, 1931, 87 — *Sideroxylon tannaense* Guillaumin, Journ. Arn. Arb. 13, 1932, 14 — *Planchonella Grayana* St. John, B. P. Bish. Mus. Bull. 120, 1934, 38 — *Hormogyne tahitensis* (Nad.) Pierre MS. in Herb. Paris.

Although several synonyms have been well described and some of them have, in addition, been pictured, none of the descriptions encompasses the polymorphy of the species as interpreted here. An amplified description may therefore precede the enumeration of the exsiccata, on which it is based.

Shrubs to moderate-sized trees with milky juice, 2—16 m high (6—20 m f. Kirk), trunk 0.10—0.75 m in diam. (0.30—0.90, very rarely 1.5 m f. Kirk), growing from the sea coast to an altitude of about 1000 m. Branchlets fairly slender, the youngest parts minutely appressedly ferruginously or greyish tomentose, soon glabrate. Leaves more or less but not densely crowded towards the tips of the branchlets, mostly light-coloured (greenish or brownish) when dry, the young ones with a sparse appressed indumentum on the petiole and underneath, very soon glabrescent, variable in shape and particularly so in size even in the same specimen and large and small leaves often irregularly intermixed, mostly oblong to oblong-obovate with a rounded apex and a decurrent base, rarely subrotundate or with emarginate apex, the size of adult leaves varying between 2.8 and 18 cm, in sterile branchlets even up to 27 cm in length and between 1.5 and 8 cm, in sterile branchlets up to 11 cm in width, the petioles being 0.7 to 5.5 cm long; midrib somewhat prominent below, almost flat above; secondary nerves conspicuous on either side, particularly below, ascending at an angle of 50°—60°, slender and rather straight, at some distance from the margin forked and more or less irregularly archingly joined, in most of the specimens 8—13 on either side of the midrib and rather wide apart, in some others, however, up to about 26 and closer together; the difference being mainly due to whether one of the tertiary nerves between each pair of secondary ones is more or less well developed and participating in the marginal archs; tertiary nerves only little less conspicuous than the secondary ones, sometimes preponderantly parallel to the secondary ones, but mostly longitudinally reticulate, the reticulation in either case extending beyond the marginal arches. Inflorescences in the axils of the leaves, 1—10-florous, the pedicels 0.2—0.8 cm long and sparsely appressedly pubescent, hardly or not elongate, somewhat incrassate in fruit. Flowerbuds globular, about 0.25 cm in diam. Calyx with 4 or mostly 5 subrotundate sepals, sparsely appressedly pubescent without, with scarious margins, glabrous within, the inner ones often minutely fimbriate. Adult flowers about 0.3 cm long. Corolla white or greenish-white, glabrous, the (4—)5 lobes rounded to subacute, 0.15—0.20 cm long, tube 0.1—0.15 cm. Stamens with ribbon-shaped white filaments, not exsert, inserted about halfway up the tube, anthers ovoid, yellow, staminodes about the same shape as the filaments but shorter and narrower, acute or acuminate, inserted in the throat; in some cases the stamens are sterile and the anthers lacking, but then the filaments are pointed as are the staminodes but slightly longer and inserted in their usual place. Ovary small, about 0.15 cm high and in diam., slightly (4—)5-angular and (4—)5-celled, pubescent with longer hairs on the rim, style very short and broadly conical or cylindrical, truncate, (4—)5-furrowed. Fruit mostly 4—5-seeded and globular, rarely 1—2-seeded and more ovoid or oblong, 2.1—3.2 cm long, 2—2.5 cm in diam., with hard glabrous pericarp enclosing the seeds, which have a comparatively thin testa and a long and narrow scar, about as long as the seed, which measures 1.6—2.4 × 0.7—1.0 × 0.4—0.7 cm. Albumen copious, surrounding the flat cotyledons.

P. costata is a fairly polymorphous species, though by no means as polymorphous as *P. sandwicensis,* to which it is closely related. I would distinguish two varieties, *austro-montana* and *vitiensis.*

Var. *α* **austro-montana** H. J. Lam, nov. var. — Folia plerumque parva c. 5—6 cm longa, coriacea, obovata, interdum majora oblonga, usque ad 15 cm longa, apice rotundata rare subacuta, basi attenuato-decurrentia; nervi secundarii numerosi approximati, utrinque 11—26, tertiarii secundariis paralleli, vix tenuiores.

Leaves mostly small and about 5—6 cm long, sometimes larger and oblong, up to 15 cm long, coriaceous, obovate, apex rounded or rarely subacute, base attenuate-decurrent, secondary nerves numerous and close together, about 11—26, hardly separable from the almost equally strong and parallel tertiary nerves.

This variety includes *Achras* (*Sapota, Sideroxylon, Sersalisia*) *costata* (*-um*) as well as *Achras Novo-Zelandica*; however, I preferred to choose in the present case the name *austro-montana* (instead of *typica,* as is recommended by the International Rules of Botanical Nomenclature) so as to indicate that this variety is possibly the ecotype of the cooler southern part of the area and at the same time of the higher hills in the more tropical regions, i. c. Fiji. The flowers are, as far as they were available (*A. C. Smith 683* from Fiji), identical to those of the other variety. Both in the size of the leaves and in the number of secondary nerves, the variety is not sharply separated from the other. The large number of secondary nerves is mainly due to the fact that the tertiary nerves are more strictly parallel to the secondary ones and less different in strength. The Fiji-specimens, though in shape and size conformable to the specimens from New Zealand and Norfolk I., are, in a way, forming a transition to var. *vitiensis,* insofar as the tertiary nerves are less strictly parallel and more distinctly weaker than the secondary ones. Their leaves are also slightly more coriaceous.

I did not see any specimen exactly agreeing with Endlicher's picture, in which the leaves are unusually narrow. The scale is not given, but either the leaves are the small type or the flowers are much exaggerated in size. Both Von Mueller and Kirk give descriptions in which the size of the flowers is correctly mentioned. In Endlicher's picture the staminodes seem exceptionally long and, curiously enough, both in this plate and in that by Kirk, the stamens are inserted at a higher level than the staminodes, which is certainly erroneous. In Kirk's plate the flowers are again exaggerated in the branchlet pictured and even slightly so in the flower given in natural size. The corolla is only as much exsert as is shown, in case it has got detached and is only held in place by the tips of the sepals, a condition that is often met with.

New Zealand: North Island: *Colenzo* in Herb. *Hooker* Aº 1854 (fl. and y. fr.; P.); Orewa, Bay of Islands: *Filhol* Aº 1875, in Herb. *Kirk* (nat. name "tawa-apou"; fr.; P.); Whangaroa: *Filhol* Aº 1875 in Herb. *Kirk* (fl.; P.).

Norfolk Island: *Lindley* Aº 1870 (P.; on one label, probably the field label, the annotation "Norfolk Isl.?" is found; the sheet is also insofar dubious, since it bears two specimens which differ altogether; one of them is the usual small-leaved form, as is pictured by *Kirk* and bears young fruit; the other one is sterile and possesses large leaves, about 14 × 6 cm).

Fiji: Vanua Levu, Thakaundrove, summit of Mt. Mbatini, 1030 m, in dense thickets: *A. C. Smith 683* (gnarled shrub, 4 m high, flow. 28—29. 11. 1933; Bish., L.), *Id. 705* (shrub, 3 m high, flow. 28—29. 11. 1933; Bish., L.).

Distribution of var. *α*: New Zealand (N. of North Island), Norfolk I., Fiji (Vanua Levu). It is uncertain, whether the species also occurs in Australia. *F. von Mueller* (Census, l. c.) mentions that the species (and then probably var. *α*) occurs in New South Wales, *Kirk* (l. c.) mentions Australia as a part of the area.

Var. *β* **vitiensis** H. J. Lam, nova var. — Folia plerumque magna, 7—15 cm longa, chartacea vel subcoriacea, elliptica vel oblonga ad sublanceolata, minora obovata, basi plus minusve abrupte decurrentia, apice rotundata, interdum obtuse acuta; nervi secundarii haud approximati, utrinque 8—13, rare usque ad 17, tertiarii paulo sed distincte tenuiores, reticulatione nervis secundariis generatim paralleli confluentes.

Leaves mostly large, 7—15 cm long, chartaceous or subcoriaceous, elliptic or oblong to sublanceolate, the smaller ones obovate, base more or less abruptly decurrent, apex rounded, sometimes bluntly acute; secondary nerves rather wide apart, 8—10, rarely up to 17, the tertiary ones little but distinctly more slender, united into a longitudinally stretched reticulation, parallel to the secondary nerves.

This variety includes the types of *Hormogyne* (*Planchonella*) *tahitensis*, of *Sapota* (*Sideroxylon, Lucuma*) *vitiensis* (*-se*), of *Planchonella Grayana* and of *Sideroxylon tannaense.* Concerning its leaf characters it is fairly polymorphous and not sharply distinguished from the other variety. The type of *Sideroxylon tannaense* shows somewhat acute leaves with few secondary nerves, but it is not essentially different from similar forms, e. g. from Tubuai which possess still more lanceolate leaves (*St. John 16513—14*). It is a curious fact that in many specimens large and small leaves are intermixed and that the small leaves are often not those situated at the tips of the branchlets (e. g. in *Crosby 99*: 6.2 × 3.2 cm with 7 secondary nerves, petiole 0.8 cm and 21 × 11.2 cm, 15 secondary nerves, petiole 4.5 cm; similar conditions are found in *Wilder 777, 950* and *1115* and in *Smith 1435*).

New Hebrides: Tana: Lenakel, alt. 200 m, common in rain forest: *Kajewski 104* (tree, 15 m high, 75 cm in diam., fr. eaten by natives?; *type specimen* of *Sideroxylon tannaense*; fl. on 6. III. 1928; A., Cal., K.; leaves rather narrow and blunt at apex; flowers ♀, no anthers extant).

Fiji: U. S. South Pac. Expl. Exp. Capt. *Wilkes*, 1838—1842 (fr.; *type specimen* of *Sapota? vitiensis*; P., K.; the leaves are oblong with a rounded apex, small and 4.5—6.5(—12) × 1.8—2.7(—4) cm in the Paris specimen, somewhat larger and up to 12 × 5 cm in the Kew one); *Horne* A° 1877—78, *nr. 317*, fl.; K., L.); Ovalau: *Id. 317a* (small tree, flowers greenish white, fl. Jan. 1878; K.); Vicinity of Levuka, on stream, alt. 400 m: *Gillespie 4487* (ster. 28. I. 1928; Bish.), rocky knobs, mountains 3 miles N.W. of Levuka: *Id. 4559* (fr. green with white bloom, 4. II. 1928), rocky coast 3 miles N. of Levuka: *Id. 4494* (rather large tree, fl. 29. I. 1928; Bish.); Vanua Mbalavu, S. limestone section, alt. 0—100 m, forest near Malatta: *A. C. Smith 1453* (tree, 8 m high, corolla white, anthers yellow, nat. name ”nggalaka“, flow. 29. III. 1934; Bish., L.); Fulanga, limestone formation alt. 0—80 m, in forest: *A. C. Smith 1208* (tree, 7 m high, flow. 22—26. II. 1934, nat. name ”nggalaka“; Bish., L.), *Id. 1154* (tree, 12 m high, fl. buds on 22—26. II. 1934, nat. name ”nggalaka“; Bish., L.); Moala, on rocky shore, North coast: *A. C. Smith 1385* (shrub, 2 m high, corolla and filaments greenish white, flow. on 20—24. III. 1934, nat. name ”nggalaka“; Bish., L.), *Id. 1386* (tree, 6—8 m high, fr. on same date, same nat. name; Bish., L.).

Samoa: Savaii, Falealupo-Tututafoe, alt. about 2 m, on shore: *Christophersen 3317* (tree, 6 m high, nat. name ”fao“?, ster. 22. 11. 1931; Bish.; leaves oblong and up to 27 × 9.6 cm, petiole up to 6.5 cm).

Tonga, Vavau: *Crosby s. n.* (fr. only; K.), *Id. 99* (leaves elliptic to somewhat obovate, small to large, 6.2—21 by 3.2—11.2 cm, petioles 0.8—4.5 cm, secondary nerves 7—15; flow.; nat. name ”kalaka“; K.), *Id. 100* (leaves broadly obovate, with subemarginate apex, about 8.5 × 6.5, petiole 1.5 cm; flow.; nat. name ”kalaka“; K.); Tongatabu, Eau, near summit: *J. J. Lister s. n.* (tree, 6—9 m high, fruits grow to size of tangerine orange, June 1889; leaves large, obovate; K.).

Cook-Islands, Rarotonga: *H. E. and S. Thew Parks 22356* (y. fr. May—July 1929; Bish., K.); *Bouchier* for *G. P. Wilder s. n.* (flow. Jan. 1932; Bish.); Mt. Tereora, in dark forests, scarce: *T. F. Cheeseman 806* (tree, 6—12 m high, with dark green handsome foliage, fr. in June 1899; K.), same locality, dry forest, hilly, rocky, alt. 210 m: *G. P. Wilder 777* (y. fr. 19. 6. 1929, nat. name ”moto“; Bish.).

Tuamotus, Makatea: alt. 100 m: *G. P. Wilder 950* (y. fr. 8. 8. 1929; Bish.); in coral and sand pockets: *Id. 1115* (tall tree, 15—30 m high, diam. 0.25 m, flow. 17. 9. 1932; nat. name ”moto“; there is a fruit accompanying this sheet which, although probably a *Planchonella*, apparently does not belong here, as it is only 1.1 cm in diam., containing two ripe seeds with hard testa, long and narrow scar and embryos with abundant albumen; Bish.).

Tahiti: In the Paris herbarium there is an empty sheet, of which the label as well as the annotations by *Pierre* agree with the description of *Sideroxylon tahitense* Nadeaud; probably the type specimen has got lost. However, there are two other sheets, bearing branchlets and fruits, apparently from the same tree, which I suggest may represent the lectotype; this specimen may be quoted in the following way: Tahiti, Mt. Raaivi: *Nadeaud* (fr. in May 1897, nat. name "moorea" [or erroneous for the island of this name?]; *type specimen* of *Sideroxylon tahitense*; P.; leaves lanceolate to oblong).

Tubuai (Austral) Islands: Rurutu, Arei, in woods on elevated dissected coral limestone, alt. 75 m: *St. John 16738* (broad-topped tree, 7 m high, 0.60 m in diam., fruit ovoid, 4-celled, on 30. 8. 1934, sap milky; Bish., L.); without exact locality: *Id. 16769a* (fr. on 2. 9. 1934; Bish., L.) — Tubuai, Pass N. of Tunarutu, in woods, alt. 150 m: *St. John 16513* (tree, 10 m high, 0.50 cm in diam., flowers and buds, sap milky, fr. green, 22. 8. 1934; largest tree 16 m high, 0.7 m in diam., bark smooth dark brown, sapwood white; Bish., L.; leaves blunt at apex); *Id. 16514* (tree, 8 m high, 0.30 m in diam., sap milky, young flow. buds 22. 8. 1934; Bish., L.; leaves sublanceolate with blunt apex).

Distribution of var. β: New Hebrides (Tana), Fiji (Vanua Levu, Ovalau, Vanua Mbalavu, Fulanga, Moala), Samoa (Savaii), Tonga (Vavau, Tongatabu), Cook Islands (Rarotonga), Tuamotus (Makatea), Tahiti, Tubuai (Austral) Isl. (Rurutu, Tubuai).

2. **P. firma** (Miq.) Dub., Ann. Mus. Col. Mars. 20, 1912, 59; H. J. Lam, Bull. Jard. bot. Buitenz. Sér. III, 7, 202, 247, 266 and 8, 1927, 471 and in Nova Guinea XIV, 4, 1932, 563.

Solomon Isl.: Bougainville, common in rain forest between Lake Luralu and Knoiguru, 1200 m alt.: *Kajewski 2124* (tree, 25 m high, fr. on 20. 8. 1930; A., L.).

Distribution: Malay Peninsula through Malaysia to the Solomon Islands.

3. **P. Garberi** Christoph., B. P. Bish. Mus. Bull. 128, 1935, 170, pro parte.

Fiji: Vanua Levu, Mbua, Upper Ndama river valley, alt. 100—300 m, forest: *A. C. Smith 1604* (tree, 8 m high, nat. name "thalavia", fr. Apr. 24—28, 1934; Bish., L.).

Samoa: Isl. Ofu, top of Nuu Islet, 75 m alt.: *Garber 1101* (*type specimen*; Bish.; fr. July 4, 1925).

Distribution: Fiji, Samoa.

Possibly only a large-fruited variety of *P. oxyedra* (see there).

4. **P. Guillauminii** H. J. Lam, nov. spec. — *Sideroxylon* spec. Guillaumin, Journ. Arn. Arb. 13, 1932, 14. — *Fig. 2*.

Arbor alta. Ramuli graciles, apices versus densiuscule foliati, apicibus adpresse pubescentibus glabrescentibus. Folia rigida coriacea novella adpresse pubescentia, mox glabrata, spathulata, apice obtusa vel interdum rotundata, e parte latissima sensim in petiolum decurrentia, supra nitidula, subtus opaca, 4.5—8 cm longa, 1.3—2.9 cm lata, petioli 0.3—0.9 cm longi; costa media supra paulo, subtus magis prominens, nervi secundarii utrinque 6—8, tenues, minute sinuosi, angulo 35°—50° de costa adscendentes, margines versus haud distincte arcuatim conjuncti, tertiarii tenuiores, laxe longitudinaliter reticulati, secundariis generatim paralleli. Inflorescentiae floresque ignoti. Fructus in foliorum axillis solitarii, pedicelli minute pubescentes 0.3—0.4 cm longi. Sepala 5 quincuncialiter inserta, patentia, late ovata, c. 0.4 cm longa, extus adpresse pubescentia, intus glabra. Fructus pericarpio laevi et duro, 1—3-spermi, ovati vel oblongi, minute adpresse pubescentes, basi obtusi, apice distincte rostrati in stylum permanentem sensim contracti, 1.7—2 cm longi, 0.7—1.3 cm diam., stylus c. 0.3 cm longus. Semina (omnia fatua), testa dura nitida dorso fusca, partem ventralem versus flavescenti, c. 1.6 × 0.7 × 0.6 cm, cicatrice angusta semine aequilonga; embryo ignotum.

A large tree, 15—25 m high, with very hard wood. Branchlets slender, towards the tips fairly densely leaved, the tips and the young leaves appressedly pubescent but soon glabrous. Leaves rigidly coriaceous, glabrous when adult, spathulate, the apex obtuse or sometimes rotundate, from the broadest part gradually narrowing towards the petiole, more or less shining above, dull underneath, 4.5—8 × 1.3—2.9 cm, the petioles 0.3—0.9 cm long; midrib prominent on either side, but stronger below, secondary nerves 6—8, slender, minutely sinuous, ascending from the midrib at an angle of 35°—50°, not distinctly archingly joined near the margin, the tertiary nerves still fainter, generally parallel to the secondary ones, longitudinally reticulate. Inflorescences and flowers unknown. Fruit solitary in the leaf-axils, the pedicels minutely pubescent and 0.3—0.4 cm

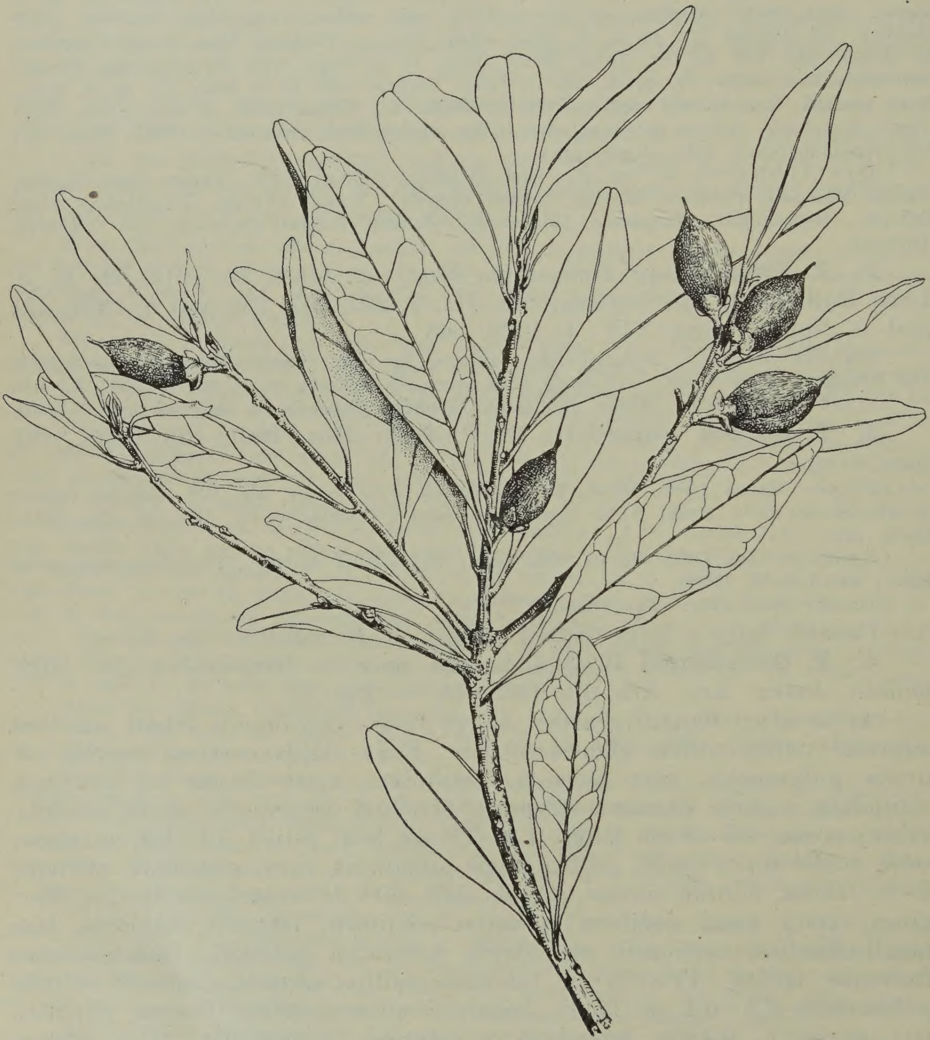

Fig. 2 — *Planchonella Guillauminii*, n. sp. — Branchlets with fruits (after *Kajewski 385*).

long. Sepals 5, quincuncially arranged, spreading, broadly ovate and about 0.4 cm long, appressedly pubescent outside, glabrous within. Fruit ovate to oblong, the pericarp hard and smooth but minutely appressedly pubescent, 1—3-seeded, base obtuse, apex distinctly rostrate by the permanent style, 1.7—2 × 0.7—1.3 cm, the style about 0.3 cm long. Seeds (all sterile) with a hard and shining testa, dark brown at back, more yellow towards the ventral side, about 1.6 × 0.7 × 0.6 cm, the scar narrow and about as long as the seed; embryo unknown.

New Hebrides: Eromanga Isl., Dillon bay, 300 m alt., common in rain forest: *Kajewski 385* (tree, 25 m high, with very hard wood, leaves light brown underneath, nat. name "ney-mor", fr. on June 8, 1928; *type specimen*, A., Cal., K.); Aneityum Isl., Anelgauhat bay, 150 m alt., common in rain forest: *Kajewski 936* (tree 15 m high, leaves dark green, good commercial timber for wood, not exposed to weather; y. fr. on March 17, 1929; A., Cal., K.).

Although the embryo is unknown, almost certainly a *Planchonella* of the relation of *P. obovata*. It is furthermore related to *P. australis* (R. Br.) Pierre from Australia and to *P. costata*, being distinguished from all these species by its narrow leaves, its short pedicels and its beaked fruit.

5. P. macropoda H. J. Lam, Nova Guinea XIV, 4, 1932, 563, tab. 117.

Solomon Islands: Ysabel Isl., Tatamba, hardwood forests, alt. 50 m: *L. J. Brass 3433* (tall, buttressed tree, with hard, slightly scaly bark and milky sap; leaves dull, stiff, concave, with loose grey minute hairs above and when young, brown hairs underneath; fruit shining black, up to 2.5 cm long and 2 cm in diam.; L.).

Distribution: N.E. New Guinea, Solomon Islands.

Its relation is with *P. firma*, but its leaves are ovate and with much larger petioles.

6. P. membranacea H. J. Lam, nov. spec. — *Fig. 3* — Arbor parva. Ramuli graciles, apicibus paulo pubescentibus, mox glabrati. Folia pauca ad ramulorum apices conferta, membranacea, oblonga, glabra, basi attenuata decurrentia, apice obtuse acuminata, 16.5—22.5 cm longa, 6.4—7.5 cm lata, petiolis c. 1 cm longis; costa media subtus prominens; nervi secundarii tenues, paulo curvati, angulo c. 60° de costa adscendentes, margines versus diminuti, haud distincte arcuatim conjuncti, tertiarii gracillimi, juxta costam eadem perpendiculares, ceterea transversaliter reticulati. Inflorescentiae floresque ignoti. Fructus sub folia in axillis foliorum delapsorum solitarii vel bini, pedicellis brevibus glabris, 0.3—0.5 cm longis. Sepala 5, patentia vel paulo reflexa, quincuncialiter inserta, rotundata, 0.2—0.3 cm longa, exteriora extus glabra, interiora adpresse pubescentia, omnia intus glabra. Fructus ovoidei, pericarpio duro sed plus minusve sulcato glabro, apice styli rudimento minuto c. 0.1 cm longo coronati, c. 2 cm longi, fere 1.5 cm diam., 4—5-spermi. Semina (omnia fatua) fructubus paulo breviora, testa crustacea, cicatrice longa angusta; embryo ignotum.

A small and slender tree. Branchlets slender, the tips somewhat pubescent but soon glabrate. Leaves few in number conferted at the very tips of the branchlets, membranous, oblong and glabrous, the base gradually narrowing and decurrent, the apex bluntly acuminate, 16.5—22.5 × 6.4—7.5 cm, the petioles about 1 cm long; midrib prominent below; secondary nerves slender, somewhat curved, ascending at an angle of about 60°, towards the margins diminishing and not distinctly archingly joined; tertiary nerves close to the midrib at right angles to this, for the rest transversely reticulate. Inflorescences and flowers unknown. Fruit single or two together in the axils of fallen leaves, the pedicels short and glabrous, 0.3—0.5 cm long. Sepals 5, quincuncially arranged, spreading or somewhat reflexed, rotundate, 0.2—0.3 cm long and in diam., the outer ones glabrous, the inner ones appressedly pubescent without, all glabrous within. Fruit ovoid with a hard pericarp but when dry somewhat furrowed, glabrous, at the tip crowned by the remainder of the style, which is about 0.1 cm long, about 2 cm long and almost 1.5 cm in diam., 4—5-seeded. Seeds (all sterile) little shorter than the fruit, with a long and narrow ventral scar. Embryo unknown.

Fiji: Vanua Mbalavu, northern limestone section, alt. 0—200 m, in forest: *A. C. Smith 1491* (slender tree, 7 m high, fr. on Apr. 2—3, 1934; *type specimen,* Bish., L.).

Although the embryo is unknown, almost certainly a *Planchonella.* The species recalls both *P. costata* and *P. micronesica,* but the tertiary nervation is distinctly transverse, a condition which is never found in either of the species mentioned.

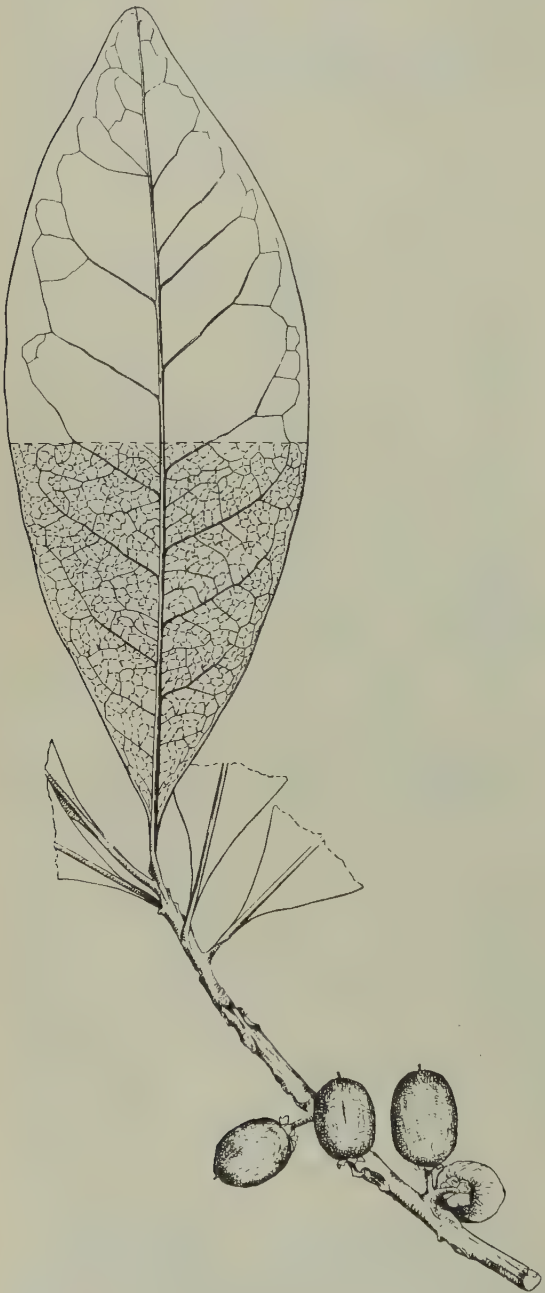

Fig. 3 — *Planchonella membranacea,* n. sp. — Branchlet with fruits (after *A. C. Smith 1491*).

7. P. micronesica (Kan.) Kan., nov. comb. in litt. — *Sideroxylon micronesicum* Kanehira, Bot. Mag. Tokyo 46, 1932, 671 and Fl. Micron. 1933, 308, fig. 156 and Journ. Dep. Agr. Kyushu Imp. Univ. 4, 1935, 388.

Caroline Islands: Kusaie: *R. Kanehira 1322* (*type specimen*; L.).
Distribution: Carolines.

Related to *P. costata* and *P. obovata,* but distinguished by its furrowed fruit and its acute and slightly acuminate leaves; from *P. costata* it is further distinguished by its smaller fruit.

8. **P. obovata** (R. Br.) H. J. Lam, Bull. Jard. bot. Buitenz. Sér. III, 7, 1925, 209, 245, 266 and 8, 1927, 473 and in Nova Guinea XIV, 4, 1932, 565.

Marianas: Saipan, in forest: *Höfer 21* (nat. name "lalaha"; B.) and *85* (large tree, flow. greenish; B.) — Guam: *A. Marche 244* (nat. name "lalaja"; P.); *Thompson 477* (K.).

Caroline Islands: Palau: *Kraemer s. n.* (nat. name "galangel"; B.) — Palau, Babelthuap, Ngarsub, in forest, alt. 200—300 m: *Ledermann 14364* (tree, 15—20 m high, flow. greenish white, nat. name "chalangl"; B.); Korror, coral limestone, 10—100 m alt.: *Id. 14079* (tree, 10—12 m high, fr. black; B.); *Id. 14239* (nat. name "galangel"; B.), Pater *Raymundus 9* and *224* (same nat. name; B.); Garasumao, forest: *M. Takamatsu 1554* (flow. Apr. 30, 1934; Bish., L.); Garudokka, forest: *Id.* 1212 (y. fr. Apr. 7, 1936; leaves lanceolate; Bish., L.) — Yap, above Keug: *Volkens 340* (B.) and *533* (or *553?*) (tree, 10 m high, flow. white; *type specimen* of *Sideroxylon glomeratum* Volk.; B.).

Solomon Islands: Ysabel Isl., Tiratona, rain-forest, alt. 600 m, common: *L. J. Brass 3338* (pyramidal tree attaining 30 m, brown fissured bark, young leaves brown underneath, older grey, flowers greenish, on Dec. 10, 1932, sap milky; A., Bish., L.).

Distribution: from the Seychelles to the Western Pacific.

A widely spread coastal and inland tree, with close relations to many other Pacific species of the genus (*P. costata, sandwicensis, australis, micronesica, Guillauminii*).

9. **P. oxyedra** (Miq.) Dub., Ann. Mus. Col. Mars. 20, 1912, 50; H. J. Lam, Bull. Jard. bot. Buitenz. Sér. III, 7, 1925, 214, 267 and 8, 1927, 474, fig. 29 — *? Sapota ? pyrulifera* A. Gray, Am. Acad. V, 1862, 328 — *Planchonella vitiensis* Gill., Bish. Mus. Bull. 74, 1930, 11, fig. 12 — *Sideroxylon aneityense* Guill., Journ. Arn. Arb. 13, 1932, 13 — *Sideroxylon* spec. no. 2 Guill., l. c. 14 — *Planchonella Garberi* Christoph., Bish. Mus. Bull. 128, 1935, 170, pro parte.

Solomon Islands: Ysabel Isl., Tiratona, common in mountain forests, 600 m: *L. J. Brass 3312* (large tree with thick, brown, slightly fissured bark and hard, brown wood; flowers white on Dec. 8, 1932, sap milky; A., Bish., L.).

Fiji: Taveuni, borders of lake East of Somosomo, alt. 700—900 m, dense forest: *A. C. Smith 920* (tree, 6 m high, flow. yellow in Dec. 1933—Jan. 1934; Bish., Bz., L.).

New Hebrides: Aneityum Isl., Anelgauhat Bay, 300 m alt., common in rain forest: *Kajewski 771* (tree, 15 m high, leaves light green, petals greeny white, flow. on Febr. 14, 1929, sweetly scented; *type specimen* of *Sideroxylon aneityense*; A., Cal., K.); *Id. 945* (tree, 18 m high, y. fr. on March 19, 1929; A., Cal., K.); *Id. 941* (tree, 15 m high, y. fr. on March 19, 1929; A., Cal., K.).

Samoa: Savaii, above Sili, alt. 200 m, forest; *Christophersen 3235* (tree, 6—8 m high, y. fr. green, on Nov. 11, 1931, nat. name "ala'a"; Bish.); same loc., ± 100 m alt., in wet forest: *Christophersen & Hume 3275* (tree, ± 10 m high, flow. on Nov. 11, 1931; nat. name "ala'a"; Bish.); Falealupo, forest, alt. ± 25 m: *Christophersen 2791* (shrub-tree, 3 m high, nat. name "ala'a"; Bish.) and *2775* (tree, 5 m high, same nat. name; ster. 30. 9. 1931; Bish.); Salailua-Lataitai, forest, alt. ± 10 m: *Christophersen 2853* (tree, 15 m high; Bish.) and *2652* (tree, 15 m high, fr. olive green on Sept. 18, 1931; Bish.).

Tonga: Vavau: *Crosby 101* (ster., March 1892; nat. name "kalaka"; K.), *Id. 295* (very young fruit Jan. 1892, latuma tree; K.).

Distribution: from the Malay Peninsula through Malaysia (Philippines incl.) and New Guinea to Fiji (f. *Gillespie*), Samoa and Tonga.

This species is far less polymorphous than *P. obovata,* though there is a certain range in some of its characters, such as the size of the leaves, the pubescence of pedicels and calyces, and the length of the corolla-tube. The last-named character, however, may depend on the age of the flower, which is not easily to be stated in dry specimens, as the flowers seem hardly to open at all.

Most of the Samoa specimens were formerly identified as *P. Garberi* Christoph., l. c. The type specimen of *P. vitiensis* Gill. was not available, but I hardly hesitate to insert this species here on account of its description and figure and of the fact that *A. C. Smith 920* bore the (authentic?) determination *Planchonella vitiensis* Gillespie.

The synonymy of *Sapota? pyrulifera* is not certain, as I did not see the type specimen. However, both Gray's description (”fructu semipollicari“) and an annotation on the Kew specimen of *Crosby 101* (*? Sideroxylon* cf. *Sapota pyrulifera* A. Gray) make the identity probable. On the other hand, Gray mentions that the fruits are 1-seeded, which is unusual in *P. oxyedra* and *Christophersen 2775* possesses unusually large leaves (up to 16.5 × 6.5 cm; sterile branchlet).

10. P. sandwicensis (A. Gray) Pierre, Not. Bot. Sap. 1890, 36; Dubard, Ann. Mus. Col. Mars. 20, 1912, 32; Skottsberg, Meddel. Göteborgs Bot. Trädgård X, 1936, 152 — *Sapota sandwicensis* A. Gray, Proc. Am. Acad. V, 1862, 328; Seemann, Fl. Vit., 1865—1870, 151 (*S. sandwichensis*); Mann, Proc. Am. Acad. VII, 1868, 188; Wawra, Flora 58, 1875, 252 — *Sideroxylon sandwicense* (A. Gray) Benth. & Hook., Gen. Pl. II, 2, 1876, 655 ex Hillebrand, Fl. Haw. Isl. 1888, 276; Engler, Bot. Jahrb. 12, 1890, 518 and in Engl. & Prantl, Nat. Pfl. Fam. IV, 1, 1897, 144, fig. 77; Drake del Castillo, Ill. Fl. Ins. Mar. Pac. 1892, 228; Rock, Indig. Trees Haw. Isl. 1913, 383, pl. 153 — *Sideroxylon spathulatum* Hillebrand, Fl. Haw. Isl. 1888, 277; Engler, l. c. 1890 and 1897; Rock, l. c. 391 — *S. rhynchospermum* Rock, Torr. Bot. Club Bull. 37, 1910, 295, figs. 2 and 3 a—b and in Report Haw. Bd. Comm. Agr. & For. 1911, 84, pl. 21 and in Indig. Trees Haw. Isl. 1913, 387 — *S. auahiense* Rock, Coll. Haw. Publ. Bot. Bull. 1, 1911, 18, pl. 5 and l. c. 1913, 387, pl. 156—158 — *Myrsine molokaiensis* Léveillé in Fedde, Repert. spec. nov. 10, 1911, 154 — *Suttonia molokaiensis* Léveillé in Fedde, l. c. 10, 1912, 373 — *Planchonella spathulata* (Hill.) Pierre in Dubard, Ann. Mus. Col. Mars. 20, 1912, 52 — *Sideroxylon Ceresolei* Rock, Indig. Trees Haw. Isl. 1913, 385 — *Planchonella aurantium* (Rock) Skottsberg, Meddel. Göteb. Bot. Trädgård X, 1936, 152 — *P. puulupensis* Baehni & Degener, Fl. Haw. 3, 13. 5. 1938 — *P. densiflora* (Hill.) Pierre MS. in Herb. Par. — *P. Meeboldii* Baehni & Degener MS. in Herb. O. Degener — *P. Remyi* Pierre MS. in Herb. Par.

Trees or more rarely shrubs, with milky juice, up to 12 (acc. to field labels) or even 20 (acc. to Rock) m high, up to 0.6 m in diam. Branchlets slender, terete, greyish, the tips often more or less densely appressedly rusty pubescent, more rarely subglabrous. Leaves estipulate, extremely variable in size, shape, thickness, colour (when dry) and indumentum, mostly oblong, elliptic, ovate, obovate or more rarely almost circular, base always acute, sometimes cuneate or decurrent, apex rounded to bluntly acute, margins entire, (1.2—)3—15(—31.5, sterile branchlets) cm long, (0.6—)1.3—7.5(—10.3) cm broad, petioles (0.5—)1.2—3.5(—4) cm, blade more or less rigidly chartaceous or subcoriaceous, greenish, yellowish or brown above when dry, when thin often with involute margins, glabrous from the beginning or with a dark or light brown, golden, yellowish or whitish indumentum, particularly in youth and on the lower surface; indumentum more or less dense, woolly or appressed, more or less soon disappearing with age, the upper side always glabrescent; midrib strongly prominent below, secondary nerves numerous, arising at an angle of (45°—)50°—80°(—90°) from the midrib, conspicuous but not very much prominent on either side except on lower one, generally rather straight, sometimes slightly curved, very close to the midrib abruptly descending, very close to the margin united into rather flat arches or intramarginal nerve almost straight; number hardly to be stated on account of the main tertiary nerves being almost as strong as the secondary ones, but number of marginal arches 6 or 7 in the smallest, up to about 50 in the largest leaves; however, these arches may in the middle of the leaf be broken into two smaller ones if a stronger tertiary nerve is reaching the margin; in general there are about 4—12 stronger nerves to the cm, owing to the condition whether one or three of the tertiary nerves are stronger or all tertiary nerves are reticulate (yet generally parallel to the secondary ones). Inflorescences fasciculate in the leaf-axils, mostly 1—4-, rarely up to 7-, or even 12-florous, the fruits mostly solitary or two, very rarely three together; pedicels densely appressedly ferruginously or golden-brown or greyish tomentose, sometimes glabrate in fruit, very variable in length, the flowers and fruits from almost sessile to pedicels up to 3 cm long in flower, up to 3.5 cm in fruit, slender or thick. Sepals 5, quincuncially arranged, densely pubescent outside, glabrous within, almost circular or ovate to deltoid and acute, 0.25—0.5 cm long (buds 0.35—0.6 cm, acute to ovoid), in fruit hardly enlarged but often patent or somewhat reflexed, the calyx up to 1.0 cm in diam. Corolla pale green (*Forbes 1076*), glabrous, somewhat exsert, 0.3—0.6 cm long, the tube 0.1—0.2 cm long, the 5 lobes imbricate, ovate with rounded or broadly and bluntly acute apex, and 0.25—0.4 cm long. Androeceum usually extant, very rarely reduced (Rock, *Sid. auahiense*). Stamens 5, inserted in the throat, filaments about as long as the anthers, often the upper portion curved inward when young, anthers ovoid or cordate to oblong and somewhat mucronate at tip, often dehiscing in the bud; staminodes 5, large and broad, petaloid, oblong or oblong-ovate, the apex rounded or acute and sometimes ligulate (broadened at tip), 0.18—0.25 × 0.05—0.125 cm. Ovary 0.25—0.3 cm high, 5-celled, glabrous or covered with appressed hairs far up the style, at base surrounded by a usually entirely, rarely partly free disc, the rim and surface of which is densely covered with long erect hairs which envelop the whole basal part of the ovary; style columnar or slightly tapering, the stigma rounded or slightly clavate and provided with 5 minute pores; ovules attached in the upper half of the cells. Fruit minutely pubescent or mostly glabrous, the pericarp mostly rather thick, hard when dry, when living apparently either hard or fairly pulpous, very rarely (particularly in 1-seeded fruits) thin, 5—1-seeded, very variable in size and shape, globular, pyriform or obpyriform to oblong, the apex rounded or distinctly beaked, sometimes slightly furrowed, 1.5—5 cm long and 1.1—3.5 cm in diam., when ripe greyish white yellow, orange or reddish to blackish purple, the flesh mostly yellowish; seeds more or less flattened, pointed or more or less rounded, rarely beaked at both ends, to ovoid (in 1-seeded fruit), variable in size, 1.15—3.7 cm long, 0.6—1.4 cm broad and 0.4—0.7 cm across; scar almost as long as the seed and 0.1—0.2 cm broad; testa usually very hard and bony, 0.1—0.15 cm thick, very rarely thin and flexible; albumen abundant; cotyledons flat and foliaceous; radicle hardly to fairly exsert — *Type specimen: Rémy 478.*

Planchonella sandwicensis is one of those extremely polymorphous groups, for which some insular floras, and particularly the Hawaiian Islands, have a certain reputation. I may recall here such cases as that of *Croton Scouleri* from the Galapagos Islands (Am. Journn. Bot. 22^2, 1935, 69) and of *Nesoluma* (Occ. Pap. B. P. Bish. Mus. XIV, 1938, 127), *Gouldia* (B. P. Bish. Mus. Bull. 147, 1937), *Astelia* (B. P. Bish. Mus. Bull. 117, 1934), *Pittosporum*, etc. of the Hawaiian Islands.

In the case of *Planchonella sandwicensis* the polymorphy is so extreme that it will probably be a hard task to convince local residents that even the most divergent specimens can, at least by morphological methods only, not be separated into different species. I have had the opportunity to examine and compare more herbarium specimens (to be exact, 160) of this species than probably any other systematist, including the type specimen as well as the types of all synonyms. I have studied this single species for more than four years and with a number of systematic methods. I have invited two of my junior collaborators to study the group unbiased by my views, and one of them, Mr. J. E. Boeke, has taken the trouble to work up the material along statistical lines. All our results pointed to the well-known alternative: either many small species with extremely vague boundaries, giving rise to endless discussions about the specific delimitation as well as about the identification of individual specimens, or one single large and polymorphous species. The choice was, after all, not difficult, for *P. sandwicensis*, with all its polymorphy, is, as a whole, sharply distinguished, even from the closely related *P. costata* from the Southern Pacific, by its broad and petaloid staminodes. I have no objection whatsoever against being a species splitter, as long as there actually is something to be adequately split up, and in the present case everything pointed to the conclusion that there isn't. This conclusion needs, however, not necessarily be final, as important means of investigation lay beyond our possible reach, viz. field observations, cytological studies, etc. The former comprise not only ecological studies but also such characters as cannot be sufficiently well investigated in dried material, i. e. particularly the fruit characters. I am fully aware of the fact that I am in a most unfavourable position in comparison with such authors as Rock, who had an opportunity to study the species in the field and who did a great deal of collecting work himself. Although there are, taxonomically speaking, some less felicitous points in his work, it generally makes a trustworthy impression and it is, therefore, a perilous thing

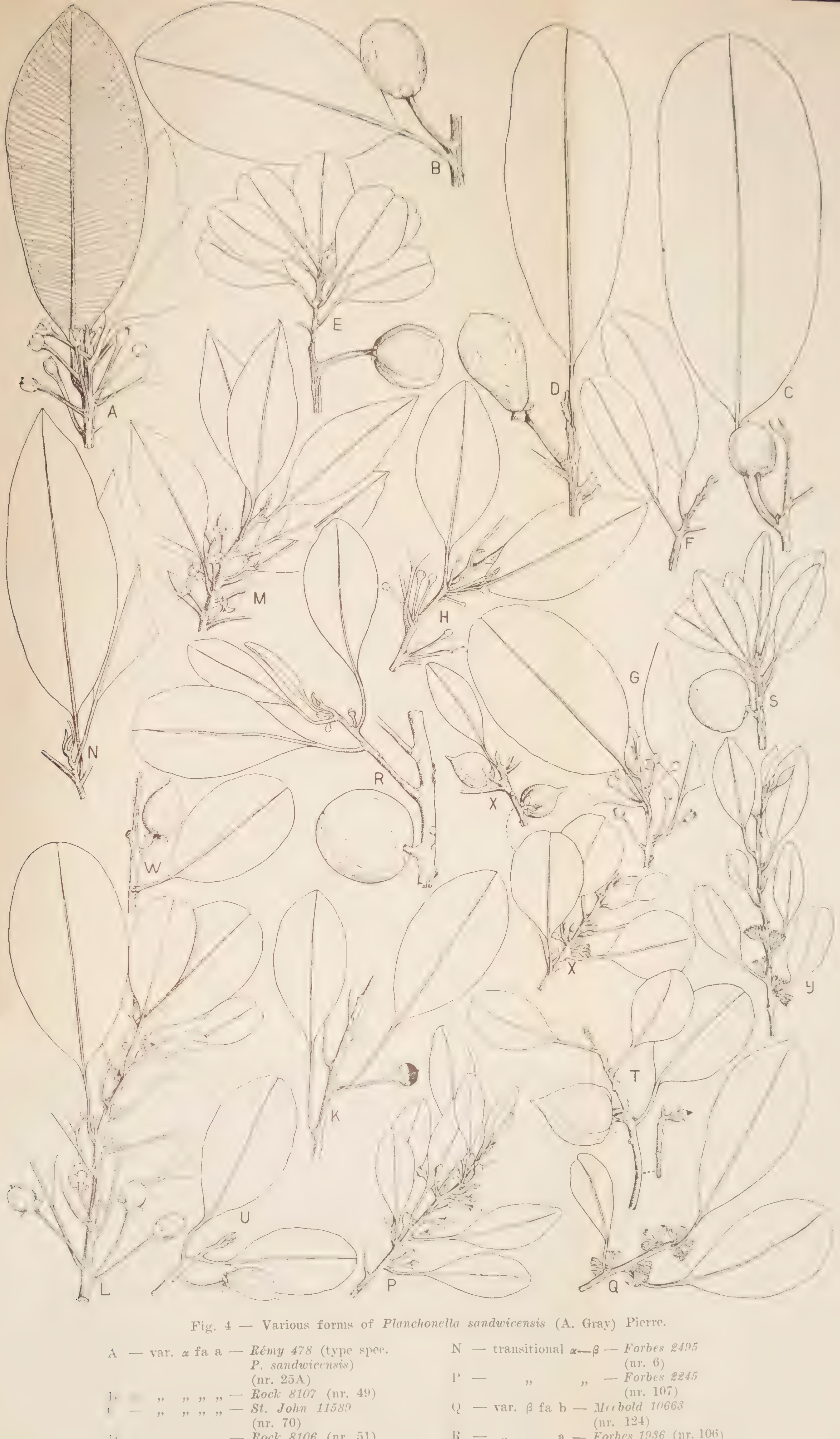

Fig. 4 — Various forms of *Planchonella sandwicensis* (A. Gray) Pierre.

A — var. α fa a — *Rémy 478* (type spec. *P. sandwicensis*) (nr. 25A)
B — „ „ „ „ — *Rock 8107* (nr. 49)
C — „ „ „ „ — *St. John 11589* (nr. 70)
D — „ „ „ „ — *Rock 8106* (nr. 51)
E — „ „ „ „ — *Munro 285* (nr. 21)
F — „ „ „ „ — *Forbes 2112* (nr. 9)
G — „ „ „ „ — „ *1773* (nr. 7)
H — „ „ „ „ — „ *1439* (nr. 8)
K — „ „ „ „ — *Bryan 660* (nr. 86)
L — „ „ „ b — *St. John 10362* (nr. 73)
M — transitional α—β — *Rémy 476* (nr. 98)
N — transitional α—β — *Forbes 2495* (nr. 6)
P — „ „ — *Forbes 2245* (nr. 107)
Q — var. β fa b — *Meebold 10663* (nr. 124)
R — „ „ „ a — *Forbes 1936* (nr. 106)
S — „ „ „ „ — *Rock (B)* (nr. 154)
T — „ „ „ „ — *Forbes 2073* (nr. 158)
U — „ „ „ „ — „ *46* (nr. 112)
W — „ „ „ „ — *Rock 8684* (nr. 129)
X — „ „ „ „ — *Munro 54* (nr. 169)
Y — „ „ „ „ — *Rémy 475* (nr. 172) (type spec. *P. spathulata*)

All figures half of natural size.

to venture and disagree with so thorough an author on fundamental points. The conclusion cannot be but this one, that in the present work we give the results of our merely morphologically taxonomic investigations as a possible working basis for those local botanists, who feel inclined to check our results in the field and to give a final shape to the taxonomy of what I provisionally cannot but consider one species.

Before entering at some length upon the ideas of previous botanists and particularly of Rock, let me now mention the considerations to which our studies of the material have led us.

As has already been pointed out, this material shows an amazing variability in practically all characters (cf. *Fig. 4*). This affects particularly the following points:

Leaves large to small,
  apex rounded to acute,
  chartaceous to coriaceous,
  glabrous to pubescent (indumentum more or less woolly or appressed, and dark rusty brown, bright brown, golden brown or yellow, or silvery grey).

Pedicels long to very short (flowers almost sessile)

Sepals large to small,
  rounded to acute

Fruits large to small
  rounded at apex or more or less beaked,
  fleshy or more or less hard and dry.

There are undoubtedly several more characters in which a certain variation may be stated, such as: numbers of flowers in the leaf axil, petals and staminodes rounded to more or less acute, ovary (apart from the disc which is always pilose) glabrous or pubescent, seeds rounded or acute (insufficiently known to me), etc., but those enumerated above are probably the most important ones, and it may be remarked that they all allow smooth gradations between the extremes. At my suggestion, Mr. Boeke choose five sets of them for a statistical investigation, viz. leaves large to small, leaf apex rounded to acute, pedicels long to short, sepals rounded to acute and fruit with rounded or acute apex. His results will be more circumstantially dealt with in a separate paper ¹), but it may be mentioned here that they also pointed to the total absence of any sharp discontinuities, although he could distinguish two main groups. As, however, the extreme types of these groups are so far apart as to make some sort of subdivision desirable for merely practical purposes, the extremes having of old been distinguished as *Sideroxylon sandwicense* and *S. spathulatum* respectively, I recapitulated Boeke's results in a somewhat abbreviated form, with regard to the fact that some characters show a certain undeniable correlation. These correlations are generally the following. Larger leaves with rounded apices are generally found in specimens with long pedicels and rounded sepals. In general, it may be stated that acuteness of the leaf tips correlates with acuteness of the sepals

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¹) Cf. "Blumea" V, No. 1, pp. 47—60.

and, though to a smaller degree, of the petals and the staminodes and possibly even of the fruits. The indumentum shows less clear correlations, but the grey-silvery indumentum seems to occur particularly in the smaller leaves. Meanwhile, these correlations are, of course, by no means strict or exclusive. In fact, it is on account of the many exceptions, that no discontinuities could be stated and most of the characters mentioned show the phenomenon of homologous variations, being exceptions to the rule of the correlations. For instance, specimens with rounded leaf tips and more or less acute sepals are by no means rare (most of them are classified under var. β, see below), but acute-tipped leaves rarely go together with more or less rounded sepals (only 3 specimens, viz. nrs. 86 [α], 107 [α—β] and 102 [β]; for the signification of the numbers see below.) However this may be, the correlation mentioned enabled me to simplify the scheme and to imply only three characters in order that all specimens can be arranged in a two-dimensional scheme. These characters are the length of the leaves, the shape of the leaf tips and the length of the pedicels. *Fig. 5* contains all specimens quoted underneath, indicated by the number used in Boeke's work. These numbers are corresponding with the specimens in the following way:

1. C. N. *Forbes* 989 — 2. *C. N. Forbes* 648 — 3. *C. N. Forbes* 845 — 4. *C. N. Forbes* 381 — 5. *C. N. Forbes* 1076 — 6. *C. N. Forbes* 2495 — 7. *C. N. Forbes* 1773 — 8. *C. N. Forbes* 1439 — 9. *C. N. Forbes* 2112 — 10. *J. F. Rock* 8002 — 11. *J. F. Rock* 8003 — 12. *J. F. Rock* 8063 — 13. *J. F. Rock* 8510 — 14. *J. F. Rock* 8670 — 15. *H. L. Lyon* 6061 — 16. *J. F. Rock* 17057 — 17. *H. St. John* 10582 — 18. *C. Skottsberg* 1004 — 19. *G. C. Munro* s. n. (June 27, 1915) — 20. *G. C. Munro* 407 — 21. *G. C. Munro* 285 — 22. *G. C. Munro* 264 — 23. *J. F. Rock & Hammond* 8064 — 24. *W. Hillebrand & J. M. Lydgate* s. n. (Maui) — 25A. *J. Rémy* 478 — 25B. *Ballieu* s. n. — 25C. *V. Krajina* 125 — 26. *W. Hillebrand* s. n. (Molokai) — 27. *C. N. Forbes* 138 — 28. *C. N. Forbes* 8 — 29. *C. N. Forbes* 115 — 30. *C. N. Forbes* 1669 — 31. *C. N. Forbes* s. n. (March, 1920) — 34. *C. N. Forbes* 1944 — 37. *C. N. Forbes* 199 — 39. *G. C. Munro* 204 — 41. *G. C. Munro* 53 — 42. *G. C. Munro* 52 — 43. *G. C. Munro* s. n. (Apr. 1915, Haalelepaakai) — 44. Abbé *Faurie* 687 — 45. Abbé *Faurie* 686 — 46. *J. F. Rock* 2198 (= 1495) — 47. *J. F. Rock* 5512 (= 5509) — 49. *J. F. Rock* 8107 — 51. *J. F. Rock* 8106 — 52. *J. F. Rock* 8122 — 54. *G. P. Wilder* 455 — 57. *J. F. Rock* s. n. (Kauai, Oct. 1911) — 58. *J. F. Rock* 2085 — 59. *J. F. Rock* s. n. (Kauai, 1910) — 60. *J. F. Rock* 5507 (= 5509) — 61. *J. F. Rock* 5511 (= 5509) — 62. *J. F. Rock* 1507 (= 1495) — 63. *J. F. Rock* 2197 (= 1495) — 64. *J. F. Rock* 1624 (= 1495) — 65. *G. C. Munro* 263 — 66. *O. Degener*, etc. 11067 — 68. *J. F. Rock* 10150 — 69. *C. M. Cooke* 3 — 70. *H. St. John* 11589 — 72. *H. St. John* 9937 — 73. *H. St. John* 10362 — 74. *A. Meebold* s. n. (Oahu) — 75. *C. N. Forbes* s. n. (Febr. 12—19, 1909) — 77. *C. N. Forbes* 2113 — 78. *E. Y. Hosaka* 992 — 79. *E. Y. Hosaka* 860 — 81. *E. Y. Hosaka* 1015 — 83. *E. Y. Hosaka* 841 — 84. *E. Y. Hosaka* 665 — 85. *G. R. Ewart* III, 61 — 86. *E. H. Bryan Jr.* 660 — 88. *G. W. Russ & D'A. Welch* s. n. (June 22, 1933) — 89. *R. Inouye* s. n. (Nov. 5, 1933) — 90. *J. Rémy* 478a — 92. *E. Christophersen* 3666 — 93. *E. Christophersen* 3664 — 96. *N. H. Krauss* s. n. (Jan. 8, 1933) — 97. *N. H. Krauss* s. n. (May 14, 1933) — 98. *J. Rémy* 476 — 99. *G. C. Munro* 392 — 100. *J. F. Rock* 7077 — 101. *J. F. Rock* 17120 — 102. *J. M. Lydgate* s. n. (Kauai) — 103. *C. N. Forbes* 2040 — 104. *C. N. Forbes* 1882 — 105. *C. N. Forbes* 1927 — 106. *C. N. Forbes* 1936 — 107. *C. N. Forbes* 2245 — 112. *C. N. Forbes* 46 — 113. *C. N. Forbes* 137 — 114. *A. F. Judd* 19 — 115. *W. Hillebrand* s. n. (Oahu) — 116. *H. St. John* 11584 — 118. *C. N. Forbes* 1979 — 119. *C. N. Forbes* 2018 — 120. *C. N. Forbes* 2114 — 122. *G. C. Munro* 394 — 123A. *V. Krajina* 127 — 123B. *V. Krajina* 128 — 124. (*A. Meebold* in) Herb. *Degener* 10663 — 125. *C. Skottsberg* 1820 — 126. *J. F. Rock* 17029 — 127. *J. F. Rock* 10029 — 128. *J. F. Rock* 3971 (= 3966 = 3973) — 129. *J. F. Rock* 8684 — 130. *J. F. Rock* 8668 — 132. *J. F. Rock* (A) — 134. *C. N. Forbes* 31 — 135. *C. N. Forbes* 98 — 136. *C. N. Forbes & J. C. Bridwell* 2460 — 137. *A. Meebold* s. n. (Huehue) — 138. *A.*

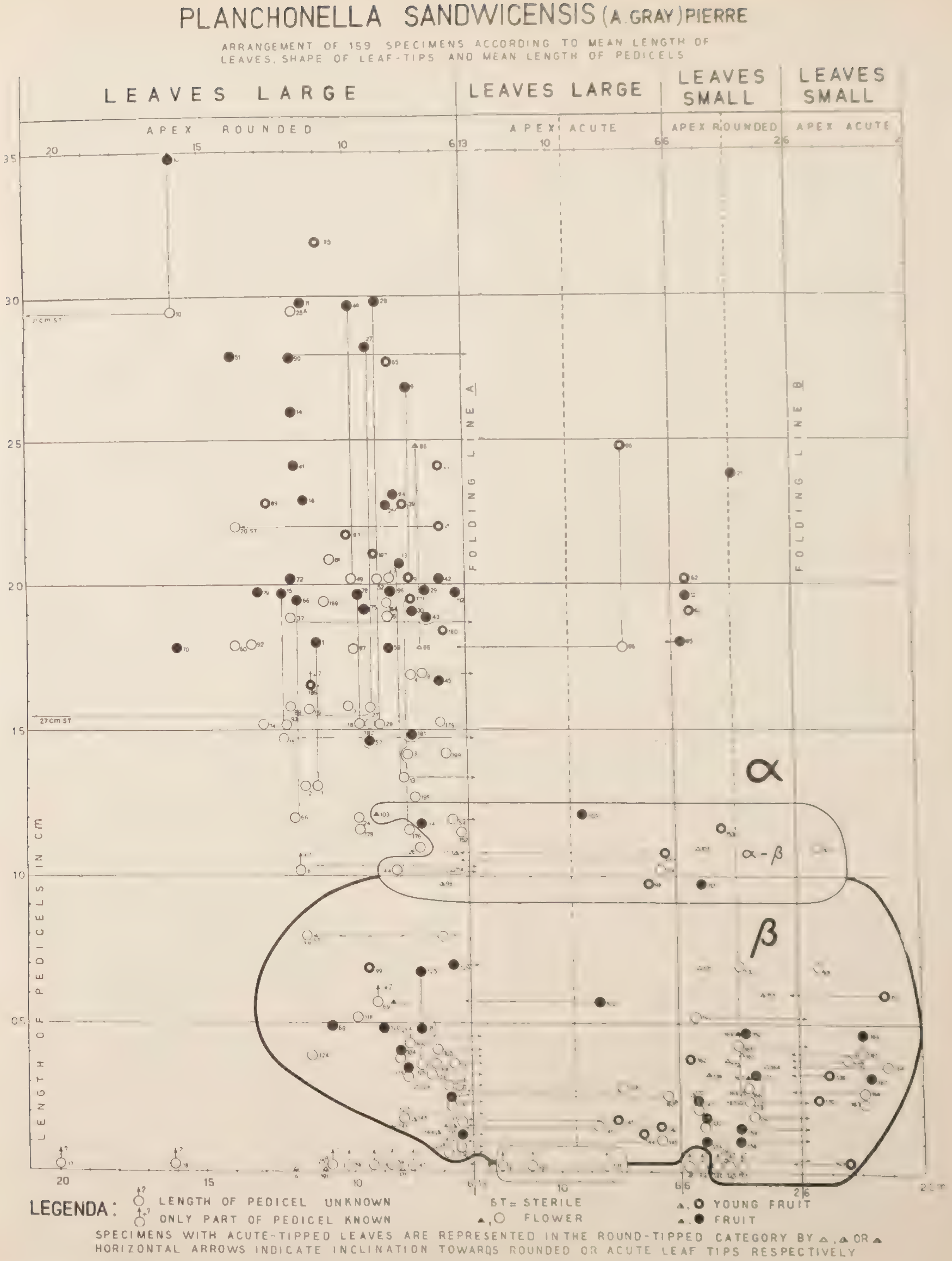

Fig. 5 — N.B. In the legenda it is indicated that plants with acute-tipped leaves bearing flowers or young fruits, are represented by a black triangle. As has been mentioned in the next line underneath, this should, of course, be open or half-black triangles respectively, in accordance with the open or half-black circles for specimens bearing flowers or young fruits and having round-tipped leaves.

The only specimen left out it *Munro 54a* (cf. note on p. 19).

Meebold s. n. (Kilauea) — 139. *Shea & Stevens* s. n. (Jan., 1928) — 140. *C. Skottsberg* 668 — 141. *C. Skottsberg* 1963 — 143. *J. F. Rock* s. n. (March, 1912, Puuwaawaa) — 144. *J. F. Rock* s. n. (Puuwaawaa or Kapua) — 145. *J. F. Rock* 3820 — 146. *J. F. Rock* 3912 — 147. *J. F. Rock* s. n. (Maui, Oct. 1910) — 149. *C. N. Forbes* 118b — 150. *C. N. Forbes* 118 — 152. *J. F. Rock* 6154 — 153. Abbé *Faurie* 435 — 154. *J. F. Rock* (B) — 155. *A. F. Judd* 49 — 157. *C. N. Forbes* 2066 — 158. *C. N. Forbes* 2073 — 161. *C. N. Forbes* 297 — 162. *C. N. Forbes* 108 — 163B. *G. C. Munro* 32 — 164. *W. Hillebrand* s. n. (Lanai) — 165. *G. C. Munro* s. n. (May 12, 1915) — 166. *G. C. Munro* 401 — 167. *G. C. Munro* s. n. (Apr. 6, 1915, Kaa) — 169. *G. C. Munro* 54[1]) — 170. *G. C. Munro* 244 — 171. *J. F. Rock* 8039 — 172. *J. Rémy* 475 — 173. *G. P. Wilder* 88 — 176. *H. St. John* etc. 10724 — 177. *A. F. Judd* s. n. (June 4, 1938) — 178. *Hillebrand* s. n. (leg. 1858, Oahu, Nuuanu) — 179. *Hillebrand* s. n. (Maui, Kanapali, Aug. 1870) — 180. *Hillebrand* s. n. (Maui, Wailuku) — 181. *Knudsen* (herb. *Hillebrand*) s. n. (Kauai) — 182. *Hillebrand* s. n. (leg. 1874) — 183. *Hillebrand* s. n. (leg. 1874, Lanai) — 184. *Hillebrand* s. n. (Lanai, July 1874) — 185. *O. Degener & H. Wiebke* 2278 — 186. *O. Selling* 3689 — 187. *O. Selling* 3674 — 188. *L. M. Cranwell* 3516 — 189. *C. Skottsberg* 2851 — 190. *O. Selling* 3349 — 191. *L. M. Cranwell, O. Selling & C. Skottsberg* 2779 — 192. *O. Selling* 3365 — 193. *L. M. Cranwell, O. Selling & C. Skottsberg* 3210.

The figure shows an arrangement of these 159 specimens according to the average length of the pedicels (ordinate) and to the average length of the leaves (abscissa). Both categories in the abscissa are subdivided into two subcategories: leaf-apex rounded and leaf-apex acute. The items in the subcategories leaf-apex acute have, in addition, been transferred by a small triangle into the subcategories leaf-apex rounded. Those specimens in which pedicels of flowers or fruits were not extant, have been put at the bottom abscissa only, according to the length and the shape of their leaves. In this way it is possible to survey, by means of folding the sheet along the lines A or B respectively: 1. all specimens with rounded leaf-tips (column 2 folded inward, col. 4 outward), which shows at the same time all specimens involved, as the acute-tipped ones are represented by a triangle, and 2. all specimens with acute leaf-tips (col. 1 folded outward, col. 3 inward). As specimens with flowers, young fruits and ripe fruits have been indicated by separate signs, it is shown that the specimens with pedicels longer than about 2 cm are mostly fruiting ones, though not exclusively so (nrs. 10, 25A and 73). It is also evident that the pedicels use to enlarge after flowering time in those specimens in which they are long from the beginning, while the enlargement is scanty or even none in the specimens with subsessile flowers. As a tendency towards acuteness of the leaf tips in rounded leaves is indicated by arrows pointing towards the acute-tipped subcategory and, likewise, a tendency to rounded apices in generally acute-tipped leaves by arrows pointing towards the subcategory with rounded tips, it is shown that, in general, the specimens with shorter pedicels show an inclination to have their leaf-tips more or less acute.

The given arrangement shows an almost continuous band of specimens running from the large-leafed long-pedicelled type to the smaller-leafed short-pedicelled one, leaving entirely blank only the area in which long-pedicelled specimens with small acute leaves would have to be inserted, if there would be any. The impression is suggesting itself that the continuity would even be still more complete, as more material would be available. Yet, as it is, there is one slight discontinuity just below the 1 cm pedicel length line and this yields a welcomed opportunity for the subdivision which is desirable from a merely practical standpoint. It roughly divides the material into what I cannot give a higher taxonomic rank than varieties, which I propose to call *α typica* and *β spathulata,* the characters of which will be enumerated underneath; and I would probably have chosen the rank of formae, if there would not be a certain geographical difference between the two. Still, there remained some 14 specimens which did not allow themselves to be inserted in either of the two varieties. These have been kept apart as transition forms and a short argumentation for their transitional nature will be added to the quotation of each specimen. In *Fig. 5* these specimens have been encircled by a line. This group underlines the lack of discontinuities in the characters involved. These conditions seem to make it rather improbable that the characters of the fruits and of the seeds will prove to yield essentially different views on the taxonomy. But, as has been said above, this has to be left to an investigation by local botanists. That a museum taxonomist has to be extremely careful in his conclusions is shown by the fact that two small groups of specimens were sufficiently well distinguished to be given the rank of formae (and fruits and seeds might lead to similar considerations), distinguished by me as var. *α typica* forma *puulupensis* and var. *β spathulata* forma *densiflora.* My attention to this condition was drawn by the fact that Rock (Indigenous Trees of the Hawaiian Islands, 1913, p. 383) bases his key to the five species of *Sideroxylon,* distinguished by him, primarily on the number of flowers in a leaf axil. This character apparently shows no sharp limits either, so that Rock's key is, taxonomically speaking, not very practical. I found the following figures among the 82 flowering or fruiting specimens:

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[1]) *Munro 54a*, pasted to the same sheet as *54* and, though from a different locality, bearing the same name, was only detected later. Possibly there is still a third specimen on this sheet (Mahana, fr., Nov. 22, 1913), but this has not been separately considered.

variety / nr. of flow. p. leaf axil	α	α—β	β	Total
1	10	1	7	18
1—3(—4)	22	5	29	56
(1—)4—7	5	—	2	7
6—12	—	—	1	1
Total	37	6	39	82

By far the greatest number showed 1—3, rarely 4 flowers per leaf axil, viz. 32 out of 37 α's, all transition forms and 36 out of 39 β's, in total 74 out of the 82, procentually about equally distributed over the two varieties. Of the 8 remaining specimens 5 belong to var. α; they include the type of *Planchonella puulupensis* (nr. 66) and four more or less similar specimens, all from Oahu (viz. nrs. 73, 74, 78 and 93). Neither by this nor by any other character this type can be sharply distinguished from the rest of the material, yet they might provisionally be taken together under the name of forma *puulupensis*, exclusively on account of the number of flowers in the leaf axils being (1—)4—7, instead of 1—3(—4) in the forma *typica*. The 3 other specimens, belonging to var. β, include the type of *Planchonella densiflora* (*Sideroxylon spathulatum*, var. *densiflorum*) from Oahu, which is distinguished by densely clustered many-florous inflorescences at the tips of the branchlets. Among the material examined this character is represented by only this single specimen (nr. 115), at least in so extreme a form. The two other specimens of this category (nrs. 124 and 138), including the type of *Planchonella Meeboldii* (Oahu) show unmistakable relations to it, both showing a tendency to crowded inflorescences at the tips of the branchlets, and nr. 138 (from Hawaii) is, in a way, intermediate between *P. densiflora* and *P. Meeboldii*. This small group might therefore provisionally be distinguished under the name of forma *densiflora* with (1—)4—7(—12) flowers in the leaf axils, instead of 1—3(—4) in the forma *typica*. It is almost exactly the short-pedicelled counterpart, the homologous variation, in var. β of the long-pedicelled forma *puulupensis* in var. α.

However, it must be emphasized again that these formae are probably as little as or even still less distinct than the varieties. It may be expected that there are several more specimens among the material quoted underneath, which should be inserted in one of the formae, but which have not been recognized on account of the absence of flowers or of the scantiness of the material. The latter is suggested by such specimens as *St. John 10362* and *Hosaka 992*, some sheets of which show the *typica*-condition, while others have the number of flowers per leaf-axil, by which forma *puulupensis* is characterized. These conditions again suggest that the delimitation of the formae is still more artificial than that of the varieties and that, as more specimens are available, the discontinuity of the character of the number of pedicels per leaf-axil will gradually disappear, a character which, by the way, seems not to correlate at all with any other. A very striking example of the little value to be attributed to the formae, is given by the specimens collected by A. Meebold at Huehue and at Kilauea crater road respectively. These specimens are strikingly similar in all characters, but the first-named has few, the last-named more flowers per leaf-axil. Accordingly the Huehue specimen had to be inserted in var. β, forma a, the Kilauea specimen in var. β, forma b.

After the taxonomical work was completed, I found what might be considered a geographical confirmation both of the subdivision into two varieties and of their transitional nature. At least, I hope the phenomenon is supporting my views rather than that it is put forward to prove a preconceived opinion. It appears, namely, that var. α is distinctly dominating in the western islands (Kauai and Oahu) and that it is entirely wanting in Hawaii, whereas var. β is dominating in the last-named island. Going from NW. to SE., α gradually loses its procentual preponderance and in about the same rate β increases in number. In the central group of islands (Molokai, Lanai and Maui) the two varieties are fairly equally represented. These conditions, which indicate a genetical (taxonomical) rather than an ecological origin of the variability, may be stated from the following table, in which the figures are the numbers of specimens found in each island and which, in my opinion, agrees more satisfactorily with the taxonomy of the group than a map on which the areas of Rock's species are drawn:

Island / var.	no loc. mentioned	Kauai	Oahu	Molokai	Lanai	Maui	Hawaii	Total
α	2	**20**	**28**	2	**20**	14	—	86
α—β	—	—	6	3	1	3	1	14
β	2	1	8	3	**16**	**15**	**15**	60
Total	4	21	42	8	37	32	16	160

Finally I may add a few words on previous subdivisions of the species. Asa Gray (Proc. Am. Ac. V, 1862, 328) recognizes only one species, *Sapota sandwicensis* Gray with two unnamed varieties, α with large leaves and β with small ones. Var. α agrees with our var. α *typica* (*Rémy 478*), var. β is partly a transition form (*Rémy 476*), partly var. β *spathulata* (*Rémy 475*). Hillebrand (Flora Haw. Isl. 1888, 276) mentions two species: *Sideroxylon sandwicensis* (Gray) Benth. & Hook. (= Gray's var. α) with its variety *auratum* Hill., and *S. spathulatum* Hill. (= Gray's var. β) with its variety *densiflorum*. This subdivision fairly well agrees with the views laid down in the present paper but for such minor points as the insertion of the filaments (cf. Hillebrand's key) and the distinction and diagnosis of var. *auratum* of *Sideroxylon sandwicense*. As has already been stated above, the indumentum shows very little correlation with other characters; moreover, the corolla can hardly be "densely ferruginous", as this would be a unicum in the species, and probably in the genus. At least, in the many flowers I examined, I never found a trace of pubescence in the corolla.

Later on, Pierre transferred these two species to his genus *Planchonella,* adding two MS. names which have never been validly published, *P. densiflora* (Hill.) Pierre (= *Sideroxylon spathulatum* Hill. var. *densiflorum* Hill.) and *P. Remyi.*

As more material was collected and more field work done, the progress in the knowledge of the variability of the species is showing itself in the splendid work on the indigenous trees of the Hawaiian Islands by Rock (1913, p. 381—392, Pl. 153—158), who distinguishes no less than five separate species, viz. *Sideroxylon sandwicense* (Gray) Benth. & Hook., *S. rhynchospermum* Rock, *S. auahiense* Rock with its variety *aurantium* Rock, which Skottsberg later on gave specific rank (*Planchonella aurantium*

[Rock] Skottsb.), *S. spathulatum* Hill. with its two varieties *densiflorum* Hill. and *molokaiense* (Lév.) Rock (based upon *Myrsine molokaiensis* Lév. and *Suttonia molokaiensis* Lév.) and *S. Ceresolii* (recte *Ceresolei*) Rock.

To these Baehni and Degener later on added their *Planchonella puulupensis*; a seventh species distinguished by the same authors, *P. Meeboldii*, was withheld in expectation of the results of the present paper. Even for a man who has seen a great many dried specimens, the distinction of Rock's species is not very clear. As has already been pointed out above, his key is, taxonomically speaking, little effective and though a careful comparison of his specific descriptions may lead to a general idea of the groups in question, it is certainly insufficient for a doubtless identification of a great part of the specimens. A systematic elaboration which fails to show the way to other botanists, even if the author himself may be perfectly sure to be able to attribute any given specimen to one of his species, either betrays the incompetence of its author or shows that the material did not allow a satisfactory subdivision. I am convinced that the latter condition is found in *Planchonella sandwicensis*, for it be far from me to suggest that Rock's work in this group has been a failure; future investigations have to decide what is trustworthy and lasting in his work as well as in mine. I therefore need not quote the major points of his specific descriptions. It remains to be seen whether the beakedness of the seeds of *Sideroxylon rhynchospermum* is so exclusive as to justify a separate species. The same may be said with respect to *S. Ceresolei*, the radicle of which is said to be usually long. That *S. auhaiense* should be a "good species" is, in my opinion, not proved by the unisexual flowers, by the pale glabrous leaves and by the fact that it grows in company with *S. sandwicense*, but perhaps the fruit may reveal better characters. The two other species, *S. sandwicense* and *S. spathulatum* are more or less in accordance with my two varieties, but provisionally I see no reason for maintaining a var. *molokaiensis* on so vague a distinction.

What Rock means by a "membraneous", "thin papery" or "thin chartaceous" pyrena in which the seeds should be enclosed, is not clear to me, unless the inner surface of the endocarp is referred to. That in *S. spathulatum* the radicle is described as superior, is evidently a slip of the pen. In some cases the staminodes are described by Rock as linear (*S. rhynchospermum, S. sandwicense*) but in the many flowers I dissected, I failed to discover any other than more or less petaloid, at any rate always relatively broad staminodes.

As has already been stated above, I am insufficiently familiar with the fruits, seeds and embryos and it needs further investigation on living material to state, whether their features may give rise to any more formae. This is, however, again a slippery ground to tread upon, in which one should beware of the pitfalls of homologous variations as well as of ecotypes. It should not be overlooked that homologous variations are primarily of a genetical, ecotypes of an ecological nature and that confusion or juxtaposition of such heterogeneous units should be avoided in practical taxonomy. In taxonomy the species which shows distinct discontinuities towards other species, remains the primary unit. At any rate, a thorough investigation of living material and in the field may clear up several points which cannot be detected by herbarium-taxonomy. They should include studies on fruits and seeds and their eventual correlations with other characters, further the response of the characters to various ecological factors, especially important in islands in the trade wind region with their moist windward and their dry leeward slopes. Furthermore the sterility of seeds, since in *Sideroxylon sandwicense* the seeds have often been found abortive, which fact might indicate a sterility of the embryosac and therefore a hybrid nature. This points to the desirability of an investigation of the degree of sterility of the pollen. As the precocious dehiscing of the anthers in the bud is often stated — a feature found in many other species of *Planchonella* and of related genera — it might be useful to investigate the way of the fertilization; I presume these plants are more or less, if not exclusively, autogamous, a condition which would naturally favour the variability as eventual mutations can then not escape by hybridization. Finally cytological studies and eventually genetical experiments may throw some more light on the complicated structure of what in the present paper is comprised under the name of *Planchonella sandwicensis*.

Meanwhile, what I have been able to gather from the field labels, will be mentioned at the end of the enumeration of the exsiccatae.

Var. α **typica,** nova var. (including the type specimens of *Sapota sandwicensis* var. α, *Sideroxylon sandwicense, S. rhynchospermum, Planchonella puulupensis* and *P. Remyi*) — Pedicelli longiores, in fructu elongati. Folia majora apice plerumque rotundata, rare acutiuscula. Sepala rotundata vel subacuta. Fructus plerumque majores — Pedicels 1—3, in fruit elongate and up to 3.5 cm long. Leaves mostly longer than 6 cm and with rounded apex, rarely smaller or with acute apex. Sepals rounded but not rarely more or less acute. Fruits mostly large, with rounded apex. Trees, up to 20 m high — *Type specimen: Rémy 478.*

Forma a **typica,** nova forma — Flores in axillis 1—3(—4) — Flowers 1—3(—4) in a leaf-axil — *Type specimen: Rémy 478.*

Hawaiian Islands — without exact locality: *Ballieu s. n.* (ster., P., L.); *Hillebrand s. n.* (leg. 1874, flow.; B.; pasted to same sheet a specimen of var. β).

Kauai — without exact locality: *Rock s. n.* (y. fr. in Oct. 1911; Bish.); *Id. 2198* (= *1495*) (ster. on Feb. 14—26, 1909, nat. name "alaa"; Bish., L.); *Knudsen* (herb. *Hillebrand*) *s. n.* (fr.; B.) — Kaholuamanu: *Forbes 381* (fl. buds in Sept. 1909; Bish.); same loc.: *Rock 2085* (fr. on March, 3—10, 1909; Bish.); same loc.: *Id. s. n.* (fr. in Oct. 1910; Bish.); same loc., alt. 1080 m: *Id. 5507 (= 5509)* (fl. in Sept., 1909; Bish.), *5511 (= 5509)* (fl., same date, Bish.) and *5512 (= 5509)* (ster., same date; Bish.) — Wahiawa Mts.: *Forbes 199* (fl. buds in Aug. 1909; Bish.) — Halemanu: *Rock 1507, 1624* and *2197* (all. = *1495,* y. fr. Feb. 14—16, 1909; Bish.) — Hii Mts.: *Forbes 648* (leaves glabrous and shining, tree milky, fl. buds on Oct. 21, 1916; Bish., L.) — Waimea, Kokee, Na Pali-Kona Forest Reserve: *St. John, Hosaka* and six others from Univ. of Haw. *10724* (y. fr. on Dec. 26, 1930; Bish., L.); in the woods near Kokee: *Skottsberg 1004* (ster. on Oct. 28, 1922; Bish.); Waimea Drainage Basin, West side: *Forbes 845* (flow. and buds on July 3 to Aug. 15, 1917; Bish., L.), *Id. 989* (y. fr. in same period; Bish.), *Id. 1076* (frequent, petals pale green, stamens a somewhat rusty color, flow. in same period; Bish.); Waimea, Kaunuohua ridge, Kaluapuhi trail: *Skottsberg* (per *J. Wichman*) *2851* (flow. Aug. 13, 1938; GB.).

Oahu: in the mountains: *Rémy 478a* (fr. in Apr. 1855; *type specimen* of *Planchonella Remyi*; P., L.) — Waianae Range, Mt. Kaala: *Selling 3674* (y. fr. on Sept. 29, 1938; GB.) and *3689* (y. fr. on Sept. 25, 1938; GB.); same locality: *Faurie 686* (y. fr. in Nov. 1909; Bish.); slopes of Mt. Kaala, Mokuleia: *Forbes 1773* (flow.

on Apr. 26 to May 16, 1912; Bish., L.); Mt. Kaala, 600—660 m alt., Waianaeuka: *Krauss s. n.* (fr. on Jan. 8, 1933; Bish.); same loc., E. ridge, 600 m alt.: *St. John 9937* (fr. on Oct. 13, 1929; Bish.); N.E. slope of Mt. Kaala, Mokuleia, second gulch E. of Puu Kaupakuhale, 540—600 m alt.: *Krauss s. n.* (flow. on May 14, 1933; Bish.); Makaleha ridge: *Rock 17057* (fr. on May 2, 1918; Bish.); Mt. Kaala, Mahaka Valley: *Forbes s. n.* (fr. on Feb. 12—19, 1909, Bish.); same loc., lower woods on ridge, 570 m alt.: *St. John 11589* (young tree, 4.5 m high, sap milky, fr. on Apr. 3, 1932; Bish., L.); Lualualei Valley, head of Valley below Puu Kanehoa, open forest, 600—700 m alt.: *Christophersen 3666* (fl. buds on May 25, 1932; tending towards forma b, but only 2—4 flowers per leaf-axil; Bish., L., O.); Ewa distr., in valley running eastward from Puu Kanehoa, 300—650 m alt.: *Krajina 125* (ster. on Oct. 30, 1929; PRC., L.); Waianauika, near the trail, 840 m alt., in wet forest: *Inouye s. n.* (nat. name "alaa", fr. on Nov. 5, 1933, Bish.); Waianae Valley, Halalua, right branch, 570 m alt.: *Russ & D'A. Welch s. n.* (fl. on June 22, 1933; Bish.) — Koolau Range, Punaluu: *St. John 10582* (tree, 12 m high, 0.6 m diam., fr. blackish purple on Sept. 28, 1930, juice milky; Bish., L.); Waipio, Kipapa gulch, north ridge, wooded, 360 m alt.: *Hosaka 665* (fr. on July 10, 1932; Bish.); same loc., second north fork, in forest, 540 m alt.: *Id. 841* (y. fr. on Nov. 13, 1932; Bish.); same loc., south ridge, in forest: *Id. 860* (fr. on Nov. 27, 1932; Bish., L.); same loc., south ridge, 510 m alt., wooded: *Id. 1015* (tree, 7.5 m high, fr. on May 6, 1933; Bish.); Ridge E. Nuuanu: *Forbes 1439* (flow. buds on Aug. 2, 1910; Bish.); Nuuanu: *Hillebrand s. n.* (leg. 1858, flow., nat. name "aulu"; B.); Pupukea-Kahuku trail: *Selling 3349* (Sept. 2, 1938; GB.).

Molokai — Gulch of Halawa: Coll. *Hillebrand s. n.* (fl. buds; B., P.); eastern highland, Kawela trail: *Cranwell 3516* (flow. on Sept. 21, 1938; GB.).

Lanai — without exact locality: *Rémy 478* (*type specimen* of *Sapota sandwicensis*[1]); P., L.); *Hillebrand s. n.* (July 1870, flow.; *type specimen* of *Sid. sandwicense*, var. *auratum*; B.) — Mahana Valley: *Rock 8002* (fr. on Aug. 1, 1910; Bish., L.) and *8003* (fr. on same date; Bish.); Mahana ridge, top: *Id. 8122* (flow. and fr.; Bish.); Mahana, open wooded forehills: *Id. 8063* (fr. on July 25, 1910; Bish.); Mahana Valley: *Rock & Hammond 8064* (flow. and fr. on July 22, 1910; Bish.) — Hookio ridge, Pohaku: *Munro 52* (fr.; Bish.), *263* (y. fr. on Dec. 10, 1913; Bish.) and *264* (y. fr. on same date; Bish.); ridge between Hookio gulch and head of Maunalei gulch: *Id. 407* (y. fr. on Feb. 27, 1915; Bish.); Hookio ridge, Haalelepaakai: *Munro 53* (nat. name "aulu" or "kaulu", fr.; Bish.), *285* (fr. on Dec. 26, 1913; Bish.) and *s. n.* (y. fr. on Apr. 6, 1915; Bish.) — Kaiholena ridge: *Munro s. n.* (flow. on June 27, 1915; Bish.); Kaiholena Valley: *Rock 8106* (fr. on Aug. 3, 1910; Bish.); Kaiholena Valley?: *Rock 8107* (flow. and fr. on Aug. 3, 1910? Bish., L.) — Mts. near Koele: *Forbes 8* (flow. buds in June 1913; Bish.), *46* (fr. on same date; Bish.) and *138* (fr. on same date; Bish.).

Maui — West Maui, ridge of Wailuku: *Hillebrand & Lydgate s. n.* (flow. buds; Bish.); same locality: *Hillebrand s. n.* (y. fr.; B.; pasted to same sheet as following specimen); gulch of Kanapali; *Hillebrand s. n.* (Aug. 1870, flow. buds; B.; pasted to same sheet as preceding specimen; ridge north of Pohakea gulch, arid Lantana-Dracaena-plain near rainforest: *O. Degener & H. Wiebke 2278* (flow. on July 23, 1927; B.); Hanaula: *Forbes 115* (y. fr. in June 1910; Bish.); Honokowai Valley, Amalu branch, valley side, 810 m alt.: *Ewart III, 61* (fr. on Dec. 21, 1928; Bish.); Haelaau to Puu Kukui trail, 900 m alt.: *Bryan Jr. 660* (flow. and y. fr. on Dec. 21, 1928; Bish., L.) — East Maui, Nahiku: *Lyon 6061*[2]) (fr. — not found on this sheet, H. J. L. — on Jan. 15, 1909; *type specimen?!* of *Sideroxylon rhynchospermum*; of this, sterile, specimen a photograph has been reproduced in Torr. Bot. Club 37, 1910, 299 as well as in Rock, Indig. Trees Haw. Isl. 1913, Pl. 154; Bish.); Auwahi: *Rock 8670* (fr. in Nov. 1910; Bish., L.); Auwahi, Ulupalakua: *Munro 204* (y. fr. on Dec. 2, 1915; Bish.); Auwahi, south slope of Haleakala: *Forbes 2112* (fr. purple, on March 27, 1920; Bish.,

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[1]) The Paris Herbarium contains two sheets labeled *Rémy 478*, one from Oahu with fruits (as mentioned by *Gray* in Proc. Am. Ac. V, 1862, 328) and one from Lanai with flowers. The latter has been chosen for a lecto-type of the species. Its label mentions the name of *Chrysophyllum sandwicense Hillebr.* (the specific name in a different handwriting), which is obviously an error. This name is therefore a nomen nudum.

[2]) The label was *Rock (C)* but I presume this specimen is identical with *Lyon 6061.*

L.); same loc.: *Id. 2113* (fr. large, obtuse, pointed, yellow when ripe, March 27, 1920; Bish.); slopes of Haleakala, back of Makawao, 900 m alt.: *Rock 8510* (flow. and fr. in Sept. 1910; Bish.) — Ridge, left side Kipahulu: *Forbes 1669* (fr. on Nov. 18, 1917; Bish.).

Forma b **puulupensis** (Baehni & Degener), nova comb. (including the type of *Planchonella puulupensis*) — Flowers (1—)4—7 in a leaf-axil — *Type specimen*: *Degener, etc. 11067.*

Oahu: Waianae Range, Lualualei Valley, head of valley below Puu Kanehoa, open forest, 600—700 m alt.: *Christophersen 3664* (flow. buds on May 25, 1932; Bish., L., O.) — Koolau Range, Puulupe, Kawailoa forest: *Degener, Topping, Martinez & Salucop 11067* (fl. buds on Feb. 25, 1937; *type specimen* of *Planchonella puulupensis*; Herb. Deg., G., L.); Pupukea, 450 m alt.: *Meebold s. n.* (flow. buds in May 1932; Bish.); Waipio, Kipapa gulch, in forest, 450 m alt.: *Hosaka 992* (tree, 12 m high, flow. buds and fr. on Apr. 30, 1933; Bish., L.); north fork of valley east of Palikea, stream bank, 300 m alt.: *St. John 10362* (tree, 6 m high, y. fr. on Feb. 23, 1930; Bish., L.).

Transitional between var. α and var. β are the following specimens (pedicels, if any, about 1 cm long):

Oahu — without exact locality: *Judd 19* (flow. on Dec. 18, 1927; Bish.; sepals rounded but leaves more or less acute); Honolulu, new school site: *Wilder 455* (small tree, flow. buds on Feb. 23, 1928; Bish.; sepals somewhat acute, leaves like those of preceding specimen [same tree?!]); Honolulu, side of one of the ridges in hills behind Kamehameha Girls' School: *Judd s. n.* (y. fr. on June 4, 1938; Bish., L.; sepals rounded but leaves more or less acute; very much resembling preceding specimens [same tree?!]); ridge west of Waialae Valley: *Forbes 1944* (fr. on Oct. 15, 1914; Bish.; sepals rounded but leaves small, somewhat acute and whitish underneath as is pretty frequent in var. β); ridge between Niu and Wailupe Valley: *Forbes & Bridwell 2460* (ster. on Apr. 11, 1917; Bish.; leaves fairly acute at apex); Manoa Cliff trail: *Forbes 2495* (ster. on May 1, 1917; Bish.; leaves large and very acute).

Molokai — Kamolo, 1000 m alt.: *Faurie 435* (y. fr. in June 1910; *type specimen* of *Myrsine molokaiensis*; Bish., L.; sepals and leaf tips more or less rounded but leaves very small and whitish underneath); same loc.: *Id. 687* (very young buds in June 1910; Bish.; sepals more or less rounded, leaves rather long and narrow and more or less acute); Niapulau: *Rock 6154* (flow. on Feb. 22, 1910; Bish.; sepals rounded, but leaves small and whitish underneath).

Lanai — Mts. near Koele: *Forbes 137* (y. fr. in June 1913; Bish.; close to *Forbes 46* of var. α but pedicels only 1.1 cm long and sepals slightly acute).

Maui — West Maui between Haelaau and Nakalalua on ridge leading to Kukui: *Cranwell, Selling & Skottsberg 2779* (ster., Aug. 1, 1938; GB.; leaves about 11 cm long and acute, petioles up to 5 cm long); Otowalu: *Forbes 2245* (tree, 6 m high, leaves golden, flow. on May 7, 1920; Bish.; sepals rounded and pedicels rather long, but leaves small, narrow and fairly acute) — East Maui, Auwahi, southern slope of Haleakala: *Forbes 2040* (tree, 10.5 m high, leaves smooth, shining above, white green below, fr. reddish-purple, 3-sided globose, obtuse apex, pedicel stout, March 20, 1920; Bish., L.; leaves acute and rather large, and sepals acute, but pedicels 1.2 cm long).

Hawaii — without exact locality: *Rémy 476* (y. fr.; P., L.; sepals and leaves acute, but pedicels in very young fruits 1 cm long and leaves rather large).

Var. β **spathulata** (Hillebrand), nov. comb. (including the type specimens of *Sapota sandwicensis* var. β, *Sideroxylon spathulatum*, *S. auahiense*, *Planchonella spathulata*, *Sideroxylon Ceresolei*, *Planchonella aurantium*, *P. densiflora* and *P. Meeboldii*) — Pedicels 0—0.8 cm long, in fruit not or hardly elongate. Leaves 3—12 cm long, apex rounded or often more or less acute. Sepals almost always acute. Fruits often small and sometimes beaked at apex. Shrubs or small trees, up to 10 m high — *Type specimen*: *Rémy 475.*

Forma a **typica,** nova forma — Flores in axillis 1—3(—4) — Flowers 1—3(—4) in a leaf-axil — *Type specimen*: *Rémy 475.*

Hawaiian Islands — without exact locality: *Rock (A)* (flow. buds and fr.: Bish.); *Id. (B)* (fr.; Bish.).

Kauai — Wahiawa Mts., 540 m alt.: *Lydgate s. n.* (y. fr.; Bish.).

Oahu — Waianae Range, Leilehua to Kaala trail, Haleanau: *Cooke* (per *Meinecke*) *3* (fr. on Dec. 31, 1926; Bish.); Makaleha-Mokuleia: *Rock 17029* (flow. buds in Apr. 1918; Bish.) — Koolau Range, Pupukea-Kahuku trail: *Selling 3365* (flow. on Sept. 2, 1938; GB.); same locality, lower woods, 330 m alt.: *St. John 11584* (tree, 9 m high, 0.3 m diam., flow. buds on March 6, 1932; Bish., L.); Koolau and Pupukea Forest Reserve: *Skottsberg 1820* (fr. on Sept. 15, 1926; GB., Bish.); Wailupe Valley: *Rock 17120* (old flow. on Apr. 14, 1918; Bish.).

Molokai — slopes of Puu Kolekole: *Forbes 118* (y. fr. in July 1912; Bish., L.) and *118b* (ster. same date; Bish.); Maunaloa below Kamoku, very dry district: *Rock 7077* (flow. in Apr. 1910; Bish.).

Lanai — without exact locality: *Rémy 475* (fl.; *type specimen* of *Sideroxylon spathulatum*; P., L.); *Hillebrand s. n.* (flow. in July 1870; B.) and *s. n.* (leg. 1874, flow.; B.; pasted to same sheet a specimen of var. α); *Munro 401* (flow. on Apr. 15, 1915; Bish.); *Judd 49* (y. fr. on Feb. 1, 1926; Bish.) — West End of island: *Forbes 297* (flow. in Sept. 1917; Bish.); leeside of island, dry open hills and plateau, 180 m alt.: *Wilder 88* (tree, 4.5 m high, milk sap used to catch small birds, nat. name "aulu", flow. on July 27, 1924; Bish.) — Mahana, Kaa: *Munro 54* (y. fr. on Apr. 6, 1915; Bish.) and *244* (y. fr. on Nov. 22, 1913; Bish.); Kaa: *Munro s. n.* (ster. on Apr. 6, 1915; Bish.) and *s. n.* (flow. on May 12, 1915; Bish., L.); Kalulu: *Munro 54a* (flow. on Apr. 15, 1915; Bish.; pasted to the same sheet as *n. 54*) — Mts. near Koele: *Forbes 98* (y. fr. in June 1913; Bish.) and *108* (y. fr. on same date; Bish.) — Paomai, dry forest: *Munro 32* (flow. in Aug. 1913; Bish.) — road to Maunalei gulch: *Rock 8039* (flow. and y. fr. on July 26, 1910; Bish.).

Maui — Lualailua: *Forbes 2018* (old flow. and fr. on March 17, 1920; Bish.); East Maui: *Rock 8684* (fr.; Bish., L.); Auwahi, south slope of Haleakala: *Forbes 1979* (flow. buds on March 14, 1920; Bish.), *2114* (small, pointed, yellow fr. on March 27, 1920; Bish., L.) and *s. n.* (fr. in March 1920; Bish., L.); same loc.: *Rock 8668* (fr. in Nov. 1910; *type specimen* of *Sideroxylon auahiense*; Bish., L.); south slope of Haleakala, Manawainui: *Forbes 1882* (tree, 4.8 m high, fr. yellow, like an apple, not pointed, on March 7, 1920; Bish., L.); south slope of Haleakala, Lauman Forest: *Forbes 1927* (new leaves purplish-golden or tan; fr. yellow, many, small, flow. and fr. on March 11, 1920; Bish., L.) and *1936* (fr. like a small apple, yellow, same date; Bish., L.); south slope of Haleakala, Kamana: *Forbes 2066* (tree, 10.5 m high, crown nearly as broad, trunk 0.35 m in diam., ster. on March 23, 1920; Bish., L.) and *2073* (tree, 10.5 m high, more than 0.3 m in diam., bark gray, rather smooth, fr. on same date; Bish., L.); Kahikinui: *Rock s. n.* (fr. in Oct. 1910; *cotype* of *Sideroxylon auahiense*; Bish.); Honuaula, Ulupalakua: *Munro 392* (y. fr. on Feb. 12, 1915; Bish.) and *394* (fr. on same date; Bish.); Makawao, Waihou gulch on N.W. slope of Mt. Habakala, 900 m alt.: *Rock 10150* (fr. — not found on this sheet, H. J. L. — in March 1912; *type specimen* of *Sideroxylon Ceresolei*; Bish., L.).

Hawaii — N. Kona: *Shea & Stevens s. n.* (y. fr. in Jan. 1928; Bish.); Puuwaawaa: *Forbes 31* (y. fr. on June, 8—14, 1911; Bish.); same loc.: *Rock 3820* (y. flow. buds on June 16, 1909; Bish.), *3971 (= 3966 = 3973)* (fl. buds on same date; Bish., L.) and *s. n.* (ster. in March 1912, *type specimen* of *Sideroxylon auahiense*, var. *aurantium* and of *Planchonella aurantium*; Bish.); same loc., 660 m alt.: *Skottsberg 668* (y. fr. on Sept. 26, 1922; GB., Bish.); between Lind's and branch road to Puuwaawaa: *Skottsberg 1963* (flow. buds and y. fr. on Sept. 26, 1926; GB., Bish.); N. slope of Mt. Puuwaawaa near Holualoa-Waimea trail, 540—610 m: *Krajina 127* (flow. on May 29, 1930; PRC., L.); Puuwaawaa, near Huehue-Puuanahulu trail, 670—700 m: *Krajina 128* (flow. on May 29, 1930; PRC., L.); same loc., 900 m alt.: *Meebold s. n.* (flow. in May 1932; except number of flowers per leaf-axil almost identical with *Meebold s. n.* from Hawaii, quoted under forma b; Bish.); lava fields near Huehue: *Cranwell, Selling & Skottsberg 3210* (y. fr. on Sept. 11, 1938; GB.) — S. Kona, Kapua: *Rock 10029* (fr. in Feb. 1912, *cotype* of *Sideroxylon auahiense*, var. *aurantium*; Bish., GH., L.); Puuwaawaa or Kapua: *Rock s. n.* (y. fr.; Bish.) — Puuanahulu, on slope of dry hill near the homesteads: *Rock 3912* (flow. on June 16, 1909, nat. name "alaa"; Bish.).

Forma b **densiflora** (Hillebrand), nova comb. (including the type specimens of *Planchonella densiflora* and of *P. Meeboldii*) — Flowers (1—)4—7(—12) in a leaf-axil — *Type specimen*: *Hillebrand s. n.*

Oahu — Waianae Range, Kaala: *Hillebrand s. n.* A⁰ 1869 or 1870 (fl.; *type specimen* of *Sideroxylon spathulatum*, var. *densiflorum* and of *Planchonella densiflora*; B., P.); Makaleha Valley: *Meebold* in Herb. *Degener 10663* (flow. in Dec. 1935; *type specimen* of *Planchonella Meeboldii*; Herb. Deg.).

Hawaii — Kilauea Crater road, 1200 m alt.: *Meebold s. n.* (flow. in May 1932; Bish.).

In addition to the above-quoted specimens there are some more which were available and have been examined in an earlier phase of the work. Unfortunately, however, they were returned to their respective owners before the war and under the present conditions it is impossible to check them again. Their specific identification is pretty well certain, but as to their belonging to one of the two varieties there remains some doubt; they will therefore be enumerated separately here:

Probably var. α **typica**:

Hawaiian Islands — locality no longer known to me: *Krajina 122* (PRC.).

Oahu — without exact locality: *Rémy 477* (P.) — Waianae Mts.: *Faurie 685* (May 1910); Puu Hapepa: *Krajina 123* (March 3, 1930; PRC.).

Possibly a transition-form between α and β:

Kauai — Halemanu, near bottom of Waimea canyon: *Rock 2336* (Bish.).

Probably var. β **spathulata**:

Oahu — Mt. Kaala (*Mann & Brigham 363*; possibly forma *densiflora*; petioles very long; Bish., K.) — Koolauloa, Pupukea, Paumali Forest Reserve: *Krajina 124* (Jan. 12, 1930; possibly forma *densiflora*; PRC.).

The following data have been compiled from the field labels of the specimens quoted:

It seems that var. α, generally speaking, is the type of the wetter, var. β that of the drier regions, but this is probably only true for the extremes of both types and even Rock gives little information as to the exact habitats. Var. α is a fair-sized tree and seems to grow consociately in certain forests, β is smaller and apparently occurs more scattered. The altitudes mentioned in the labels vary between 300 and 1080 m for var. α, 180—1200 m for var. β.

The flowering and fruiting times are the following (see page 29) (I = Jan., II = Feb., etc.).

The native names given are: alaa (Kauai, Oahu, Hawaii), or aulu or kaulu (Lanai, Oahu, var. α), but only few labels make mention of them.

The fruits are, as has already been mentioned, very variable in several characters. Concerning these only very few data may be taken from the labels. One specimen of var. α (*Forbes 2113*) mentions that the fruits are "large, obtuse, pointed, yellow when ripe". A specimen, considered to be a transition form between α and β (*Forbes 2040*) has the fruits "reddish purple, globose with obtuse apex". Of some specimens of var. β from the same locality, one has the fruits "small, pointed, yellow" (*Forbes 2114*), others mention "fruits yellow like an apple, not pointed" (*Forbes 1882*), or "fruits yellow, many, small" (*Forbes 1927*), or "fruit like a small apple, yellow" (*Forbes 1936*).

Among the exsiccatae large and fleshy fruits as well as small and

	var.	Kauai	Oahu	Molokai	Lanai	Maui	Hawaii	
flower-buds	α	VII—X	II—V, VIII (E.)		VI	VIII		II—X
	α—β		II, VI					
	β		III—IV			III	VI, IX	
flowers	α	VI—IX	IV—VI		VI—VIII	IX, XII		II—IX, XII
	α—β		II, XII			V		
	β		IV (W.), XII (E.)	IV	IV—V, VII—IX	III	V—VI, IX	
young fruits	α	II, VII—VIII, X, XII	II, XI		II, IV, XII	VI, XI—XII		I—IV, VI—XII
	α—β		VI—VII					
	β			VII	II, IV, VI—VII	II—III, XI	I, VI, IX	
ripe fruits	α		I—II, IV—V, VII, IX—XI			I, III, IX, XI—XII		I—V, VII, IX—XII
	α—β		X			III		
	β		IX, XII			II—III	II	
		II, VI—X, XII	I—XII	IV, VII	II, IV—IX, XII	I—III, V—VI, VIII—IX, XI—XII	I—II, V—VI, IX	

hard ones are found both in var. α and in var. β. And though it could be presumed that, at least in some specimens, the fruits are hard and small in youth, large and fleshy when ripe, such as may be the case in the specimen *Forbes 1882,* in which both forms are extant, the fact that often both may contain ripe seeds suggests that the two types may actually represent the ripe state. As to the shape, rounded fruits (whether large and fleshy or small and hard) are found in either of the varieties in more or less equal numbers, but pointed fruits are rare in var. α. In one specimen of var. α (*Rock 8002*) they are large and fleshy, in another (*Forbes 46*) they are small and hard. They have the same shape in two transition forms (*Forbes 137* and *Faurie 435*) but for the rest all specimens with small pointed fruits are belonging to var. β.

11. P. torricellensis (K. Schum.) H. J. Lam, Nova Guinea XIV, 4, 1932, 562 — *Rapanea torricellensis* K. Schum. in Schumann & Lauterbach, Nachtr. Fl. D. Südsee 1905, 346 — *Sideroxylon acutum* Krause, Engl. Bot. Jahrb. 58, 1923, 479 — *Planchonella samoensis* (Rein.) H. J. Lam, Bull. Jard. bot. Buitenz. Sér. III, 7, 1925, 218 (nomen) and in Christophersen, Bull. B. P. Bish. Mus. 154, 1938, 35 (description), fig. 10 — *Planchonella paludosa* H. J. Lam, Bull. Jard. bot. Buitenz. Sér. III, 8, 1927, 469, fig. 28 — *Sideroxylon samoense* Reinecke MS.

Samoa: Upolu, Mulifanua forest: *Reinecke 177* (flow. in Nov. 1893; *type specimen* of *Sideroxylon samoense*; B., K.); sine loc., common everywhere in the forests: *Horne 2* (large tree, ± 18 m high, trunk almost black, up to 12 m high and 0.75 m in diam., flow. on 7. 2. 1878, nat. name "mamalana"; K.); sine loc.: *Whitmee 224* (flow.; K.); Olononoi (recte Oliononо?, Upolu): *Vaupel 324* (fr. on 1. 7. 1905; B.); Savaii, Aopo: *Vaupel 612* (B.); Savaii, Salailua-Lataitai, forest, ± 10 m alt.: *Christophersen 2628* (tree, 15 m high, flow. on 18. 9. 1931; Bish., L.).

Distribution: New Guinea, Samoa.

The localities of the specimens known suggest that the species is probably also occurring in interjacent regions, the more so as it is very close to *P. nitida* (Bl.) Dub. which covers a large area from British India to the Moluccas and the Lesser Sunda Islands inclusive. In fact, the difference seems hardly less than gradual and the only important point seems to be that in *P. nitida* the inflorescences are borne on leafless shoots, being situated in the axils of bracts instead of leaves as is the usual condition in the family. However, even in *P. nitida* the latter condition is by no means rare, though not usual. For the rest the leaves of *P. torricellensis* are mostly smaller than those of *P. nitida* and dark brown when dry (instead of greenish), and the fruits are mostly 1-seeded. Some specimens from New Guinea not quoted here, are therefore somewhat doubtful, as one of them is sterile and the other bears only a few fruits in leaf-axils. Their general habit, however, points to *P. torricellensis* rather than to *P. nitida*, but some specimens from the Lesser Sunda Islands are of almost the same type, yet have with similar doubt, been inserted in *P. nitida* on account of their locality.

The species is also very close to *P. laurifolia* (Richard) Pierre (Australia), but in that species the petals are truncate and the staminodes are rounded, not acuminate.

II. **Nesoluma** Baill.

1a. Leaves generally small and elliptic or ovate or slightly obovate with more or less broadly cuneate or subrotundate base and rounded apex, pubescent or not when young, brown or more rarely somewhat greenish yellow when dry; shape, size, and pubescence of leaves extremely variable, from oblanceolate to ovate and broadly elliptic, generally about 4—8 cm long and 2—4.5 cm broad, if up to 12 cm long then 4—6.5 cm broad, and with rounded apex; reticulation variable, minutely areolate to more irregularly reticulate; fruit 1—1.5 cm long, about 1 cm in diam. . . . . **2. N. polynesicum**
b. Leaves larger, oblong-ovate to oblong, narrowing toward the apex, which is blunt, generally 6—13(—16) cm long, 3—5.5 cm broad; reticulation minutely areolate, areoles circular; fruit 1.5—2.5 cm long 2
2a. Leaves oblong-ovate to oblong, light yellowish green when dry (always?), petioles 1.5—2.5 cm long; fruit 1.5—1.9 cm long, 0.7—1 cm in diam. . **3. N. St.-Johnianum**
b. Leaves ovate to elliptic-ovate, dark brown when dry (always?), petioles 2—4 cm long; fruit 2.5 cm long, 1.7 cm in diam. . . . . **1. N. Nadeaudii**

1. **N. Nadeaudii** (Drake) Pierre in H. J. Lam, B. P. Bish. Mus. Occ. Pap. XIV, nr. 9, 1938, 154.

Distribution: Tahiti.

2. **N. polynesicum** (Hillebr.) Baill., Bull. Soc. Linn. Par. 2, 1891, 964; H. J. Lam, l. c. 1938, 145. To be added to the literature and Synonymy; sub *Chrysophyllum polynesicum* Hillebr.: J. F. Rock, Indig. Trees Haw. Isl. 1913, 380 — *Isonandra polynesica* Benth. & Hook., Gen. Pl. II, 2, 1876, 658 ex Drake del Castillo, Ill. Fl. Ins. Mar. Pac., 1892, 229.

For the varieties and formae see our above-quoted paper (1938).

Distribution: Hawaiian Isl. (Maui to Oahu), Austral Isl. (Raevavae, Rapa).

3. **N. St.-Johnianum** H. J. Lam & B. Meeuse in H. J. Lam, l. c. 1938, 153.

Distribution: Tuamotu Isl. (Henderson I.).

III. **Palaquium** Blanco

1a. Leaves 18—32 cm long, 10—15 cm broad 2
b. Leaves 5—14 cm long, 2.5—7 cm broad 4
2a. Pedicels about 1 cm long; leaves with more or less broad base; fruits oblong-obovate, 3.8 × 1.8 cm, rounded at tip . . . . . . **1. P. erythrospermum**
b. Pedicels 3.5—6 cm long; fruits pointed 3
3a. Pedicels 3.5—4.5 cm long; leaf-base broad to acute; leaves dark brown when dry . . . . **7. P. Stehlinii**
b. Pedicels 4—6 cm long; leaf-base cuneate and decurrent; dried leaves greyish above, light-brown underneath . . . . **4. P. karrak**
4a. Petioles less than 1 cm long; leaves obovate, the secondary nerves about 7, little curved and hardly conspicuous; pedicels 1 cm long . . . **2. P. fidjiense**
b. Petioles 1.5—3.5 cm long, pedicels 2.5—3.5 cm 5
5a. Secondary nerves 5—6, strongly curved, leaves chartaceous, ovate . . . . **6. P. oxyspermum**
b. Secondary nerves 8—12; leaves rigid 6
6a. Innovations, pedicels and calyces reddish pubescent; style much exsert . . . . **5. P. neo-ebudicum**
b. Innovations, pedicels and calyces entirely glabrous; style hardly exsert . . . . **3. P. Hornei**

1. **P. erythrospermum** H. J. Lam, nova spec. — *Fig. 6* — Arbor alta. Folia glabra, oblongo-obovata, basi lata subabrupte in petiolum contracta, apice rotundata vel breviter obtuse acuminata, marginibus plus minusve undulata, 19—26 cm longa, 10—15 cm lata, petiolis solidis 2—3 cm longis;

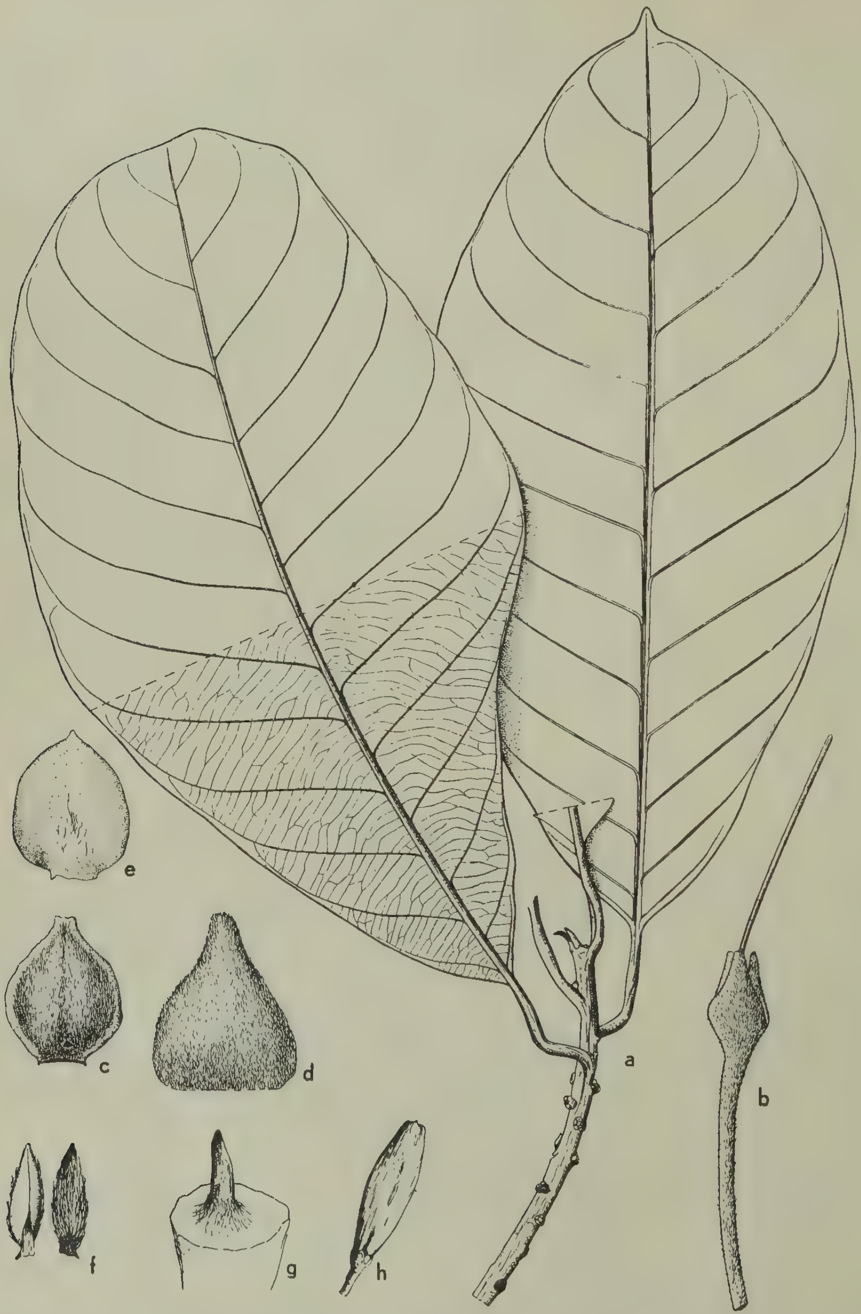

Fig. 6 — *Palaquium erythrospermum*, n. sp. — a. branchlet with leaves; b. old flower; c. inner sepal, outside; d. outer sepal, outside; e. petal, outside; f. stamens, dorsal side (right) and ventral side (left); g. ovary; h. fruit (after *Kajewski 1903*).

costa subtus valde prominens; nervi secundarii subtus prominentes, utrinque 12—15, angulo 65°—70° adscendentes, margines versus curvati et diminuti, haud arcuatim conjuncti; nervi tertiarii pertenues cum reticulatione transversi. Inflorescentiae in ramulis vetustioribus vel sub folia axillares, alabastrorum pedicelli graciles, 0.9—1.2 cm longi, cum sepalibus adpresse ferrugineo-tomentosi; sepala 3 + 3 obtuse acuminato-ovata, intus glabra, 0.3 cm longa; corolla deest; stamina in alabastris c. 14 (?), antheris extus pilosis. Ovarium 6-loculatum, tomentosum, abrupte in stylum filiformem glabrum post anthesin 1 cm longum contractum. Fructus oblongi glabri, maturi 3.8 cm longi, 1.8 cm diametro, 1-spermi, semina 1 cm diametro.

A large tree. Leaves glabrous, oblong-obovate, base broad, subabruptly contracted into the petiole, apex rotundate or shortly and bluntly acuminate, margins somewhat undulate, 19—26 × 10—15 cm, petioles stout, 2—3 cm long; midrib strongly prominent below; secondary nerves prominent below, 12—15, ascending at an angle of 65°—70°, towards the margins curved and diminished, not distinctly archingly joined; tertiary nerves transverse, very slender. Inflorescences on warts along the older branchlets, the pedicels of the buds slender and 0.9—1.2 cm long, appressedly ferruginously tomentose as are the sepals outside. Sepals 3 + 3, bluntly acuminate-ovate, glabrous inside, 0.3 cm long; corolla not extant; stamens in the bud about 14 (?), the anthers pilose outside. Ovary 6-celled, tomentose, the glabrous style filiform and about 1 cm long (old flower). Fruit oblong, glabrous, 3.8 × 1.8 cm when ripe, 1-seeded; diam. of seed 1 cm.

Solomon Isl.: Bougainville, Kugumaru, common in rain forest, alt. 150 m: *Kajewski 1903* (tree, up to 25 m high, with a milky sap, fr. on 2. 7. 1930, growing singly on stems with a red fleshy seed inside; nat. name "ooko-woru"; *type specimen*; A., L.).

Undoubtedly very close to *P. obtusifolium* Burck (E. Malaysia) or perhaps even identical with that species but provisionally kept separate because of its smaller flowers.

2. P. fidjiense Pierre in Dubard, Bull. Soc. bot. Fr. 56, 1909, Mém. 16, 10.

Fiji: Vanua Levu, Thakaundrove, Yanawai Riv. region, in dense forest on Mt. Kasi, alt. 300—430 m: *A. C. Smith 1805* (tree, 15 m high, flow. buds brown, on May 10—11, 1934; Bish.; L.).

Distribution: Fiji.

Probably this species, but in the very young bud the ovary is glabrous and the leaves are 7—8 × 3.5—4 cm. The leaves are slightly larger than in the type specimen (*Horne 1117*), of a fragment of which I made some annotations during a stay in the Paris Herbarium, viz. 7.5 × 3.3, petiole 0.2—0.8 cm, but the shape is the same.

3. P. Hornei (Hartog) Dubard, Bull. Soc. bot. Fr. 56, 1909, Mém. 16, 10 — *Dichopsis Hornei* Hartog in Baker, Journ. Linn. Soc. 20, 1883, 367.

Fiji: Vanua Levu, Thakaundrove, Yanawai Riv. region, in dense forest on Mt. Kasi, alt. 300—430 m: *A. C. Smith 1793* (tree, 12—20 m high, corolla and stamens white, good timber for building, nat. name "mbulu", flow. on May 10—11, 1934; Bish., L.).

Distribution: Fiji.

Type specimen (*Horne 717*) not seen, but the specimen quoted fits

the description and agrees with a specimen preserved in the Paris Herbarium (possibly a fragment of the type specimen), but as to its larger leaves (up to 14.5 × 6 cm, petiole 3 cm).

4. **P. karrak** Kanehira, Bot. Mag. Tokyo 45, 1931, 339 and Fl. Micron. 1933, 305, fig. 153.

Distribution: Caroline Isl. (Ponape).

Type specimen (*Kanehira 794*) checked (NY.). Some specimens, collected by *Ledermann* (*nos. 13299, 13555 and 13796*) preserved in the Berlin Herbarium under the name of *Palaquium leuconeurum* H. J. Lam (ined.) probably belong to this species. Probably related to *P. Hornei.*

5. **P. neo-ebudicum** Guillaumin, Journ. Arn. Arb. 13, 1932, 15.

Distribution: New Hebrides (Aneityum, Eromanga).

No specimen seen (*Kajewski 344* and *756*).

6. **P. oxyspermum** H. J. Lam, nov. spec. — *Palaquium* spec., Christophersen, Bull. B. P. Bish. Mus. 128, 1935, 170 — *Fig. 7.*

Arbor alta. Folia glabra, ovata, basi breviter angustata, apice obtusa, 9—13.5 cm longa, 4—7 cm lata, petiolis 2—3.5 cm longis; costa nervique subtus paulo prominentes, nervi secundarii utrinque 5—7, angulo c. 60° de costa adscendentes, margines versus valde curvati, diminuti, haud distincte arcuatim conjuncti; nervi tertiarii tenues, cum reticulatione transversi. Flores fructusque ignoti. Fructuum pedicelli crassi, 2.7—2.8 cm longi. Semina magna paulo curvato-oblonga, basi obtusa, apice acute rostrata ± deplanata, 5.9—6.8 cm longa, 2.2—2.5 cm diametro, cicatrice valde extensa, testae parte nitida tantum 0.55—0.65 cm lata, longitudine fere ea seminis aequali. Embryo exalbuminosum, cotyledones percrassi, radicula infera acuta.

A tree, about 25 m high. Leaves glabrous, thinly coriaceous, ovate with shortly contracted base and blunt apex, 9—13.5 by 4—7 cm, the petioles 2—3.5 cm long, midrib and secondary nerves somewhat prominent below, secondary nerves 5—7, ascending at an angle of about 60°, much curved and gradually diminishing towards the margins, not distinctly archingly joined; tertiary nerves and reticulation transverse. Flowers and fruits unknown. Fruit pedicels thick, 2.7—2.8 cm long. Seeds very large, somewhat curved and oblong, blunt at base, acutely rostrate and somewhat flattened at apex, 5.9—6.8 × 2.2—2.5 cm, the dull scar extremely large, the shining portion of the testa only 0.55—0.65 cm broad and almost as long as the seed. Embryo exalbuminous, the cotyledons very thick, radicle inferior and acute.

Samoa: Savaii, Le To, above Salailua, in forest, alt. 750 m: *Christophersen 2884* (tree, about 25 m high, leaves and fruit picked up on the ground, fr. on Oct. 21, 1931; *type specimen*, Bish., L.); Upolu, Malololelei, alt. 700 m: *Christophersen 29* (tree, fr. not ripe [not seen by me, H. J. L.] on Aug. 5, 1929; Bish., NY.).

In its leaf characters this species shows a resemblance with the specimen identified as *P. fidjiense* and quoted above, but the leaves are distinctly ovate, and larger.

7. **P. Stehlinii** Christoph., B. P. Bish. Mus. Bull. 128, 1935, 168, fig. 24.

Samoa: Savaii, in forest above Sili, alt. ± 300 m: *Christophersen 3255* (tree, ± 15 m high; *type specimen*; Bish., L.); N.W. Sili, on bank of rivulet: *Vaupel 341* (fr. on 18. 5. 1906; B.).

Distribution: Samoa. Also in Tonga? (cf. sub *Burckella Amicorum*).

The specimen *Vaupel 341* most probably belongs here. The leaf-base is slightly more acute than in the type specimen. The fruit pedicels are 4.5—5 cm long, the fruit is oblong and pointed at apex and usually somewhat curved, glabrous but dull and with a somewhat verrucose surface, 5—7.5 cm long and 2—2.5 cm in diam. Seeds very insufficiently known, probably 2—3 in a fruit.

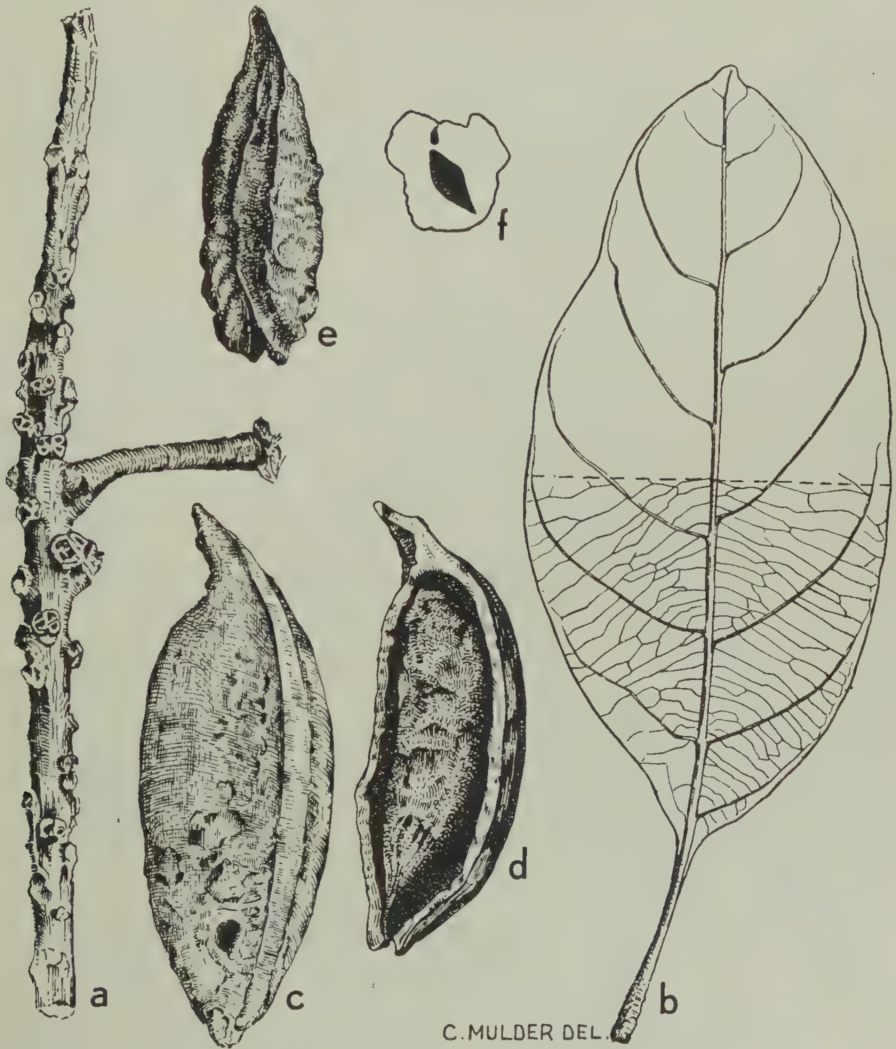

Fig. 7 — *Palaquium oxyspermum*, n. sp. — a. branchlet with fruit-pedicel; b. leaf; c. seed, semi-dorsal view, showing the narrow shining part of the testa; d. seed, longitudinal section, showing position of embryo; e. embryo (upside down); f. ditto, cross-section, showing the cotyledons (after *Christophersen 2884*).

Its relation is probably with the preceding species and, through it, with *P. obtusifolium* Burck (and *P. obovatum* [Griff.] Engl.), both from Malaysia, but the flowers and fruits are considerably larger.

IV. **Burckella** Pierre

1a. Leaves 4—10 by 2.5—5 cm 2
b. Leaves 10—25 by 5—10 cm 4
2a. Leaves obovate with cuneate base; pedicels (1.5—)2—3.5 cm long; calyx 0.5—0.6 m, corolla 1.2—1.4 cm . . . . **6. B. microphylla**
b. Leaves ovate or elliptic with broad base, pedicels 1—2 cm long . . . 3
3a. Calyx pilose, 0.3 cm long, corolla 0.6 cm, purplish . . . . **3. B. Hillii**
b. Calyx glabrous or nearly so, 0.6 cm long, corolla 1.5 cm, white . . . . **1. B. brachypoda**
4a. Calyx 0.7—1 cm long 5
b. Calyx 0.3—0.5 cm long 6
5a. Leaves rusty pubescent underneath, obovate with a cuneate base, gradually narrowing from the broadest part; calyx about 0.7 cm long . . . . **8. B. Thurstonii**
b. Leaves entirely glabrous, obovate with a broad base; calyx about 1 cm long . . . . **5. B. macrantha**
6a. Pedicels about 1 cm long, leaves up to 15 × 9 cm, with a petiole of 1.5 cm; stamens 12 . . . . **4. B. Kajewskii**
b. Pedicels 1.1—1.7 cm long, leaves 10—25 × 6—10 cm, with a petiole of 1—3.5 cm; stamens 9—16 . . . . **2. B. Cocco**
c. Pedicels 2 cm long, leaves 10—17 × 4.5—6 cm, with a petiole of 2—3 cm; stamens about 12 . . . . **7. B. obovata**

N.B. The tree last-named species seem to be closely related if not identical; this is the more probable, since *B. Cocco* is known to be fairly variable. *B. Hollrungii* (Schum.) Pierre from New Guinea and New Ireland, belongs to the same group of species.

1. B. brachypoda H. J. Lam, nova spec. — *Fig. 8* — Arbor alta. Ramuli graciles teretes glabri. Folia pergamacea glabra, elliptica vel elliptico-oblonga vel interdum paulo obovata, basi late acuta, plerumque subabrupte in petiolum contracta, apice obtusa, interdum rotundata, 4.2—10.5 cm longa, 2.6—5.3 cm lata, petiolis 0.7—1.5 cm longis; costa media subtus paulo prominens, nervi secundarii pertenues, utrinque 6—10, angulo c. 70° de costa adscendentes, mox furcati, irregulariter arcuatim conjuncti, tertiarii laxe reticulata, vix conspicui. Inflorescentiae fasciculatae pauciflorae, supra folia confertae, pseudoterminales; pedicelli glabri, ± curvati, 0.8—1.9 cm longi. Sepala 2 + 2, exteriora c. 0.6 cm longa et lata, late deltoidea, glabra vel paulo pubescentia, interiora c. 0.4 cm longa, 0.5 cm lata, subquadrangularia, sparse pubescentia vel subglabra, margine minute fimbriata. Corolla alba extus glabra, tubus 0.4 cm longus, lobi 8—10 oblongi 1.1 cm longi, 0.4 cm lati. Stamina alba 18—20 in fauce uniserialiter inserta, filamentis brevi-pilosis, c. 0.3 cm longis, antheris oblongo-acuminatis 0.2 cm longis, glabris vel dorso paucis pilis suffultis. Ovarium glabrum 4—5-loculare, 0.3 cm diam., in stylum subulatum glabrum 2.1—2.3 cm longum abrupte contractum. Fructus ignotus.

A large buttressed forest tree, 25—35 cm high. Branchlets slender and glabrous. Leaves pergamaceous, glabrous, elliptical or elliptical-oblong or sometimes somewhat obovate, the base broadly acute and mostly subabruptly narrowed towards the petiole, apex obtuse or sometimes rotundate, 4.2—10.5 × 2.6—5.3 cm, the petioles 0.7—1.5 cm long; midrib somewhat prominent below, the secondary nerves slender, 6—10, ascending at an angle of 65°—70°, rather far from the margin (0.5—0.9 cm) furcate and irregularly archingly joined, the tertiary ones almost in-

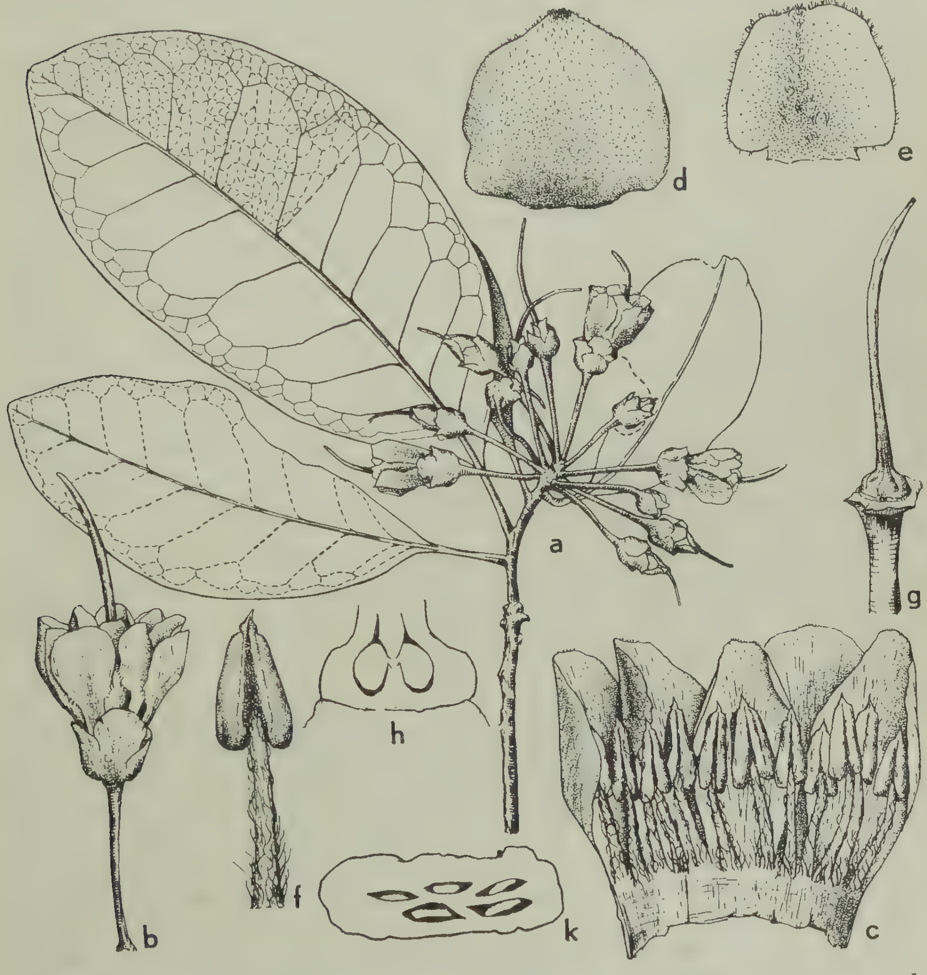

Fig. 8 — *Burckella macropoda*, n. sp. — a. flowering branchlet; b. flower; c. corolla, opened; d. sepal, outside; e. ditto, inside; f. stamen; g. ovary and style; h. ovary, longitudinal section; k. ditto, cross-section (after *A. C. Smith 1474*).

conspicuous, laxely reticulate, near the midrib a few parallel to the secondary ones. Inflorescences few-florous, but pseudoterminally conferted at the tips of the branchlets above the leaves and thus about 10—20 flowers together; pedicels glabrous, ± curved, 0.8—1.9 cm long. Sepals 2 + 2, glabrous or slightly pubescent without, the outer ones broadly deltoid and about 0.6 cm long and broad, the inner ones roughly quadrangular with a minutely fimbriate margin. Corolla white, glabrous without, the tube about 0.4 cm long, the 8 lobes oblong and about 1.1 × 0.4 cm. Stamens in one row inserted in the throat, 18—20, the white filaments shortly pilose and about 0.3 cm long, the anthers oblong-acuminate, glabrous or with some hairs on the back. Ovary glabrous, 4—5-celled, 0.3 cm in diam., abruptly narrowed into the subulate style, which is glabrous and 2.1—2.3 cm long. Fruit unknown.

New Hebrides: Banks Isl.: Rev. *Comins 320* (tree up to 21 m high, fr. edible, nat. name "natu"; K.).

Fiji: Vanua Mbalavu, Northern limestone section, alt. 0—200 m, in forest: *A. C. Smith 1474* (flow. on April 2—3, 1934; *type specimen*; Bish., L.); Kandavu, in forest: *A. C. Smith 82* (tree, 15 m high, fr. in Sept., nat. name "mbulu").

The description has been made after the type specimen. The other specimen (*Comins 320*) was no longer at hand at the time the above description was made, but fairly full annotations from an earlier examination were available. From these it may be concluded that the specimen (formerly identified as *B. Amicorum* [A. Gray] H. J. Lam) is conspecific with *A. C. Smith 1474*. The flowers are strikingly the same but in such minor points as the pedicels being up to 3.5 cm long, the corolla-tube being slightly pubescent outside and the stamens being slightly longer (filaments 0.5 cm, anthers 0.3 cm). The leaves of this specimen are also larger, viz. up to 15 cm long and 9 cm broad, with a petiole up to 3 cm. The specimen *A. C. Smith 82* bears 1-seeded fruits of 3.5 × 2 cm, with a pedicel of 2 cm and a style of 4 cm long. Its leaves are of the size of *Comins 320*.

2. **B. Cocco** (Scheffer) Pierre, Not. bot. Sap.. 1890, 3; Dubard, Rev. Gén. Bot. 20, 1908, 201; H. J. Lam, Bull. Jard. bot. Buitenz. Sér. III, 7, 1925, 125 and in Nova Guinea XIV, 4, 1932, 555 — *Bassia Bawun* (Scheff.) Guillaumin, Journ. Arn. Arb. 13, 1932, 16 (sub *Bassia Kajewskii* Guill.).

Solomon Isl.: Bougainville, Marmaromino, common in rain forest, alt. 50 m: *Kajewski 2205* (tree, up to 25 m high, young fr. on 30. 9. 1930, nat. name "maranatu"; A., L.) — Gaudalcanal, Berande riv., common in rain forest on sea level: *Kajewski 2399* (tree, up to 20 m high, pedicels pink, fruit green with deep furrowed ridges, up to 4 or 5 inches long, with a deep white flesh, similar to an apple, delicious and with a strong distinct flavour of its own, nat. name "un-garno", flow. and fr. on 1. 1. 1931; A., L.).

Distribution: New Guinea, Solomon Isl. (Bougainville, Guadalcanal).

I am in doubt, whether the fruit, accompanying *Kajewski 2399*, belongs to that specimen. It is long and pointed at both ends, about 7.6 × 2.5 cm, 1-seeded, the seed with crustaceous but not very thick testa and with a scar almost as long as the seed and occupying more than one half of its circumference, the shining part keeled (cf. *B. Hollrungii*); embryo exalbuminous.

Close to or possibly even identical with *B. Hollrungii* (Schum.) Pierre (New Guinea, New Ireland, Kerawara Isl.).

3. **B. Hillii** (J. G. Baker) H. J. Lam, nov. comb. — *Payena Hillii* J. G. Baker, Journ. Linn. Soc. Bot. 20, 1883, 338.

Distribution: Fiji.

According to the description related to *B. brachypoda* and *B. microphylla*, but distinguished by its considerably smaller (and purplish-brown) flowers (calyx pilose and only 0.3 cm, corolla twice as long), with sessile anthers (young flowers?), from the latter, moreover, by its oblong, apparently not obovate leaves. No specimen examined. The type specimen is *Horne 484.*

4. B. Kajewskii (Guill.) H. J. Lam, nov. comb. — *Bassia Kajewskii* Guillaumin, Journ. Arn. Arb. 13, 1932, 15.

Distribution: New Hebrides (Tana).

Guillaumin's very incomplete description makes it impossible to check this species with any other. According to its author it should be related to *B. Cocco.* It seems not impossible that it is conspecific with that species. The fruit is eaten by the natives. No specimen examined. The type specimen is *Kajewski 43.*

5. B. macrantha H. J. Lam, nova spec. — *Fig. 9* — Arbor mediocris. Ramuli crassi rugosi. Folia ad ramulorum apices conferta, glabra, tenuiter coriacea, obovata vel oblongo-obovata, basi lata sensim in petiolum angustata, apice rotundata, 11—15 cm longa, 4.8—6.8 cm lata, petioli 2—28 cm longi; costa media subtus valde prominens, nervi secundarii tenues, utrinque 10—12, angulo c. 65° de costa adscendentes, margines versus curvati et diminuti, haud distincte arcuatim conjuncti; nervi tertiarii saepe uno crassiore inter 2 secundarios adscendente, ceterea laxe reticulati plus minusve transversi. Inflorescentiae floresque ignoti. Florum vetustiorum pedicelli nonnulli supra folia inserti crassi, glabrescentes, 1.8—2 cm longi. Calyx extus dense adpresse pubescens, 1 cm longa, 0.8 cm lata, sepala 2 + 2, intus glabra. Ovarium glabrum, 5-loculatum, in stylum subulatum 3.7—4 cm longum contractum. Fructis ignoti.

A moderate-sized tree. Branchlets thick (1 cm) and scarred. Leaves conferted at their tips, thinly coriaceous, glabrous, obovate to oblong-obovate, the base broad and gradually narrowed into the petiole, apex rounded, 11—15 × 4.8—6.8 cm, petioles 2—2.8 cm long; midrib much prominent beneath; secondary nerves slender, about 10—12, ascending at an angle of about 65°, curved and diminished towards the margins and not distinctly archingly joined; tertiary nerves often one ascending between each pair of secondary ones, for the rest laxely reticulate and more or less transverse. Inflorescences and flowers unknown. Old flowers inserted above the leaves, 2 together, the pedicels rather thick, glabrescent, 1.8—2 cm long, the strong calyx densely appressedly pubescent without, 1 cm long and 0.8 cm wide, sepals 2 + 2, glabrous within. Ovary glabrous, 5-celled, narrowed into a filiform style of 3.7—4 cm long.

Fiji: Vanua Levu, Thakaundrove, Natewa Peninsula, Uluingala, alt. 600—820 m, dense forest: *A. C. Smith 1980* (tree, 14 m high, old flow. on June 15, 1934; *type specimen*; Bish., L.).

Although incompletely known, I venture to describe this as a new species, as I could not identify it with one of the other species known to me. It seems to be pretty close to *B. Thurstonii* but the leaves are entirely glabrous and with a broader base, not gradually narrowing from the broadest part downwards. The species is particularly distinguished by its large calyx.

6. B. microphylla H. J. Lam & E. van Olden in Christophersen, B. P. Bish. Mus. Bull. 154, 1938, 34, pl. 1B.

Distribution: Samoa (Savaii), Tonga (Vavau, Tongatabu).

Its relation is with *B. brachypoda*, but the leaves are smaller and narrower and always obovate; also, apparently, with *B. Hillii* (see there). The type specimen is *Crosby 102* (K.).

7. **B. obovata** (Forster) Pierre, Not. bot. Sap. 1890, 4; Dubard, Rev. Gén. bot. 20, 1908, 201 — *Bassia obovata* Forster, Fl. Ins. Austr. Prodr. 1786, 35; Guillaumin, Journ. Arn. Arb. 13, 1932, 16.

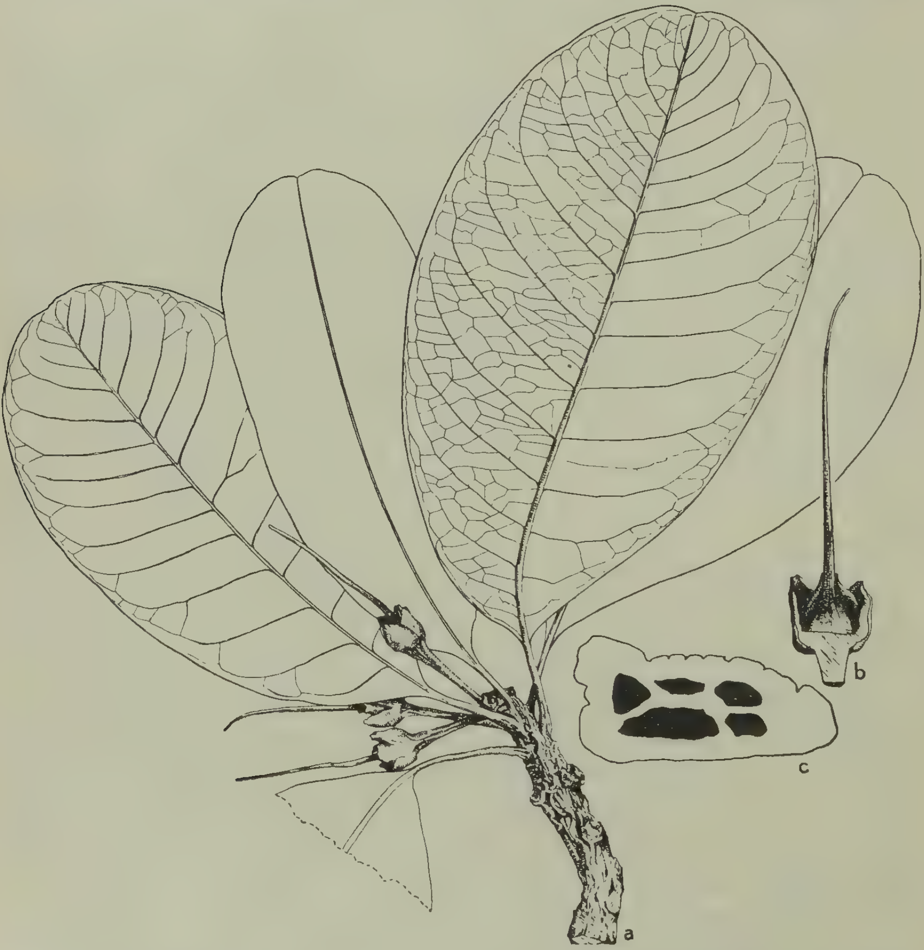

Fig. 9 — *Burckella macrantha,* n. sp. — a. branchlet with old flowers; b. flower without corolla, opened so as to show ovary and style; c. ovary, cross-section (after *A. C. Smith 1980*).

Leaves conferted at the tips of the rather thick branchlets, glabrous, obovate with cuneate base and broad, shortly and bluntly acuminate apex, 10—17 by 4.5—6 cm, petioles 2—3 cm long; midrib prominent below, secondary nerves almost inconspicuous above, distinct underneath, 11—13, ascending at an angle of about 65°, straight, archingly joined near the margin; tertiary nerves ascendent near the midrib, towards the margins reticulate. Infloresccences few-florous, in the axils of the uppermost leaves, the pedicels about 2 cm long, appressedly pubescent. Calyx pubescent, 0.3 cm long. Corolla pubescent outside, tube 0.4 cm long, the 6—7(—?) lobes 0.6—0.8 cm, throat pilose. Stamens about 12, the filaments pilose, as are the tips of the anthers, which are 0.4 cm long. Ovary glabrous, 4-celled, the style about 2 cm long. Fruit unknown.

Distribution: New Hebrides (Tana; according to *Guillaumin* also in Aneityum, Efate and Banks).

Description of the type specimen (*Forster*) in the Kew Herbarium. Apparently closely related to *B. Cocco* (or even identical with that species?).

8. **B. Thurstonii** (Hemsley) H. J. Lam, Bull. Jard. bot. Buitenz. Sér. III, 7, 1925, 259; Gillespie, B. P. Bish. Mus. Bull. 74, 1930, 12, fig. 13 — *Bassia Thurstonii* Hemsl. in Hooker, Ic. Pl. 26, 1899, t. 2569.

Distribution: Fiji.

Well distinguished by its large, profusely pilose flowers and its numerous (± 40) stamens. Type specimen (*Thurston*, Aug. 1874, herb. Kew) checked.

To be excluded:

B. Amicorum (A. Gray) H. J. Lam, in Christophersen, B. P. Bish. Mus. Bull. 154, 1938, 35 — *Bassia Amicorum* A. Gray, Proc. Am. Acad. 5, 1861—62, 327 — *Madhuca amicorum* (A. Gray) Macbride, Contrib. Gray Herb. N. S., 53, 1918, 18.

The type specimen — I examined a fragment of the type from the Paris Herbarium — is probably a mystification. The leaves are almost certainly those of **Planchonella costata** (*tahitensis*), the detached flower accompanying the sheet is undoubtedly that of some **Palaquium** species, although thusfar no species of that genus has been reported from Tonga. This explains Gray's description: "corolla glabra 6-partita ..... staminibus 18", as well as an annotation by Pierre with the name *Palaquium amicorum* Pierre.

The pedicel of the single flower extant is appressedly pubescent and 4.8 cm long; sepals appressedly pubescent outside, glabrous within, acute and 0.6 cm long; corolla glabrous, about 1.4 cm long (of which the tube measures about 0.3 cm), petals oblong; stamens glabrous, in approximately one row, filaments slender, anthers oblong-acuminate, 0.4—0.5 cm. Ovary densely pubescent, 6-celled, the style filiform and 2.8 cm long. This description fits pretty well that of *Palaquium Stehlinii* from Samoa, but that species should not necessarily be also a native of Tonga; the flowers may have been washed ashore as well, as the specimen has been collected on the beach.

V. **Manilkara** Adanson

1a. Flowers small, calyx 0.4—0.7 cm long 2
b. Flowers larger, calyx 0.8—1.4 cm long 4
2a. Leaves broadly obovate, 5—9 by 3.5—6.5 cm, base broad, apex conspicuously

emarginate; secondary nerves 15—17; pedicels of fruits 1 cm long; fruit about 1.8 × 0.8 cm . . . . **2. M. emarginata**

b. Leaves narrowly obovate, rarely broader than 4 cm, base narrowly cuneate, apex rounded to subacute or slightly emarginate 3

3a. Secondary nerves, though faint, distinguishable from the tertiary ones and at the margin archingly joined; ovary with shallow glabrous adnate disc at the base; scar of the seed small, elliptic, basiventral, about 0.3 × 0.2 cm . . . . **1. M. dissecta**

b. Nervation striate, all nerves about as faint, close to the margin united to form a distinct intramarginal nerve; ovary without disc; scar of the seed long and narrow, ventral, about 0.8 × 0.2 cm . . . . **5. M. udoido**

4a. Secondary nerves practically inconspicuous, the tertiary nervation minutely areolate; leaves dark brown when dry; calyx 1.1—1.4 cm long; dorsal appendages to the petals about 2/3 their length; staminodes large and fimbriate . . . . **3. M. samoensis**

b. Secondary nerves, though faint, distinctly conspicuous; leaves light greyish-brown or greenish when dry 5

5a. Tertiary nervation longitudinally reticulate, parallel to the secondary nerves; calyx 0.85—1 cm long; dorsal appendages to the petals 2/3 their length; staminodes large and fimbriate, about half as long as the petals; ovary with shallow glabrous adnate disc at the base . . . . **4. M. Smithiana**

b. Tertiary nervation areolate; calyx 1.1—1.2 cm long; dorsal appendages about 1/4—1/5 the length of the petals; staminodes, if any, small and subentire, about 1/5—1/6 the length of the petals; ovary without disc . . **6. M. vitiensis**

1. M. dissecta (L. f.) Dubard, Ann. Mus. Col. Mars. 23, 1915, 13; Guillaumin, Journ. Arn. Arb. 13, 1932, 15; H. J. Lam, Blumea 4, 1941, 325, fig. 1 (synonyms given there are: *Achras dissecta* L. f., *Mimusops dissecta* R. Br., *Mimusops Pancheri* Baillon, *Manilkara Pancheri* [Baillon] Dubard).

There are two varieties:

Var. α **typica** Maas Geesteranus in H. J. Lam, l. c. 1941, 327 — Leaves glabrous even when young. Pedicels subglabrous, in flower 1.7—2.1, in fruit 2.5—2.8 cm long. Fruits ovoid or subglobose, 0.5—0.7 cm in diam.

Var. β **Pancheri** (Baill.) Maas Geesteranus, l. c. — Leaves tomentose below, subglabrescent. Pedicels pubescent, in flower 2.2—2.7, in fruit 2.7—3.7 cm long. Fruits oblong, 0.45—0.5 cm in diam.

Distribution: Samoa, Tonga, New Caledonia.

2. M. emarginata H. J. Lam, Bull. Jard. bot. Buitenz. Sér. III, 7, 1925, 241 and in Blumea 4, 1941, 342.

Insufficiently known and not certain whether actually wild.

Distribution: Hawaii (Oahu).

3. M. samoensis H. J. Lam & B. Meeuse, Blumea 4, 1941, 338, fig. 10.

Distribution: Samoa.

4. M. Smithiana H. J. Lam & R. Maas Geesteranus, Blumea 4, 1941, 328, fig. 2.

Distribution: Fiji (Vanua Mbalavu).

5. M. udoido Kanehira, Bot. Mag. Tokyo 47, 1933, 677 and Fl. Micron. 1933, 304, fig. 154; H. J. Lam, Blumea 4, 1941, 333, fig. 6.

Distribution: Caroline Isl. (Palao).

6. M. vitiensis (H. J. Lam & E. van Olden) B. Meeuse in H. J. Lam, Blumea 4, 1941, 339, fig. 11 (synonym given there is *Northia vitiensis* H. J. Lam & E. van Olden).

Distribution: Fiji.

VI. **Northiopsis** Kanehira

1. **N. Hoshinoi** (Kanehira) Kanehira, Fl. Micron. 1933, 402, fig. 152, Bot. Mag. Tokyo 47, 1933, 677 and Journ. Dept. Agr. Kyushu Imp. Univ. 4, 1935, 388; H. J. Lam, Blumea 4, 1941, 344 — *Northia Hoshinoi* Kanehira, Bot. Mag. Tokyo 46, 1932, 489.

Distribution: Caroline Isl. (Ponape), Samoa (Savaii).

VII. **Mimusops** L.

1. **M. Elengi** L., Sp. Pl. ed. I, 1753, 349; H. J. Lam, Bull. Jard. bot. Buitenz. Sér. III, 7, 1925, 234, 244, 245, 268 and 8, 1927, 479.

Var. β **parvifolia** (R. Br.) H. J. Lam, l. c. 1925, 236; Guillaumin, Journ. Arn. Arb. 13, 1932, 14 (sub *M. parvifolia* R. Br.).

Solomon Islands: Ysabel Isl., Maringe, rain forest on limestone hills, 100 m alt.: *L. J. Brass 3297* (medium-sized tree with white flowers and green fruit on Dec. 7, 1932; A., Bish., L.) — Florida Isl. (N'gela), hills, rain forest, alt. 75 m, common: *Id. 3512* (tree, about 15 m high, flower buds on Jan. 25, 1933; A., Bish., L.).

Distribution of the species: British India to W. Pacific; of the variety: Malaysia and W. Pacific (Solomon Isl., New Hebrides, Loyalty Isl., New Caledonia).

List of Collectors

Note. In the list given underneath have been enumerated the numbers (s. n. = sine numero) quoted in the present paper and in addition those published earlier in Bull. B. P. Bish. Mus. 154, 1938, 34—35 (*Burckella microphylla*)
Blumea IV, 1941, 323—358 (*Manilkara* and *Northiopsis*).

For *Nesoluma* the list in Occasional Papers B. P. Bish. Mus. XIV, 1938, Nr. 9, 156—157 should be consulted.

The genera and species have been indicated by their number of sequence.

Balansa 1821 (V, 1, β); 3470 (V, 1, β) — *Ballieu* s. n. (I, 10, α, a) — *Bouchier* for *Wilder*, G. P. s. n. (V, 1, β) — *Brass*, L. J. 3297 (VII, 1, β); 3312 (I, 9); 3338 (I, 8); 3433 (I, 5); 3512 (VII, 1, β) — *Bridwell, J. C.*, see *Forbes, C. N.* — *Brigham*, see *Mann* — *Bryan Jr., E. H.* 660 (I, 10, α, a).

Cheeseman, T. F. 806 (I, 1, β) — *Christophersen, E.* 29 (III, 6); 2628 (I, 11); 2652 (I, 9); 2660 (*Stehlin*) (VI, 1); 2775 (I, 9); 2791 (I, 9); 2853 (I, 9); 2884 (III, 6); 3235 (I, 9); 3255 (III, 7); 3317 (I, 1, β); 3319 (VI, 1); 3364 (I, 10, α, b); 3666 (I, 10, α, a) — *Christophersen, E. & Hume* 2474 (IV, 6); 3275 (I, 9) — *Colenzo* s. n. (Herb. Hook.) (I, 1, α) — *Comins* 320 (IV, 1) — *Cooke, C. M.* (per *Meinecke*) 3 (I, 10, β, a) — *Cranwell, L. M.* 3516 (I, 10, α, a) — *Cranwell, L. M., O. Selling & C. Skottsberg* 2779 (I, 10, α—β); 3210 (I, 10, β, a) — *Crosby, C. S.* 100 (I, 1, β); 101 (I, 9); 102 (IV, 6); 295 (I, 9); s. n. (I, 1, β) — *Curran* 132 (V, 2).

Degener, O. 11067 (I, 10, α, b); see also *Meebold, A.* — *Degener, O. & Wiebke* 2278 (I, 10, α, a).

Ewart, G. R. III, 61 (I, 10, α, a).

Faurie, Abbé 435 (I, 10, α—β); 685 (I, 10, α); 686 (I, 10, α, a); 687 (I, 10, α—β) — *Filhol* s. n. (Herb. Kirk) (I, 1, α) — *Forbes, C. N.* 8 (I, 10, α, a); 31 (I, 10, β, a); 46 (I, 10, α, a); 98 (I, 10, β, a); 108 (I, 10, β, a); 115 (I, 10, α, a); 118 (I, 10, β, a); 118b (I, 10, β, a); 137 (I, 10, α—β); 138 (I, 10, α, a); 199 (I, 10, α, a); 297 (I, 10, β, a); 381 (I, 10, α, a); 648 (I, 10, α, a); 845 (I, 10, α, a); 989 (I, 10, α, a); 1076 (I, 10, α, a); 1439 (I, 10, α, a); 1669 (I, 10, α, a); 1773 (I, 10, α, a); 1882 (I, 10, β, a); 1927 (I, 10, β, a); 1936 (I, 10, β, a); 1944 (I, 10, α—β); 1979 (I, 10, β, a); 2112 (I, 10, β, a); 2040 (I, 10, α—β); 2066 (I, 10, β, a); 2073 (I, 10, β, a); 2112 (I, 10, α, a); 2113 (I, 10, α, a); 2114 (I, 10, β, a); 2245 (I, 10, α—β); 2495 (I, 10, α—β); s. n. (Feb. 12—19, 1909) (I, 10, α, a); s. n. (Aug. 1913)

(I, 10, β); s. n. (March 1920) (I, 10, β, a) — *Forbes, C. N.* and *J. C. Bridwell* 2460 (I, 10, α—β) — *Forster* s. n. (IV, 7); s. n. (V, 1, α).

Garber 1101 (I, 3) — *Germain* s. n. (V, 1, β) — *Gillespie* 4487 (I, 1, β); 4494 (I, 1, β); 4559 (I, 1, β).

Hammond, see *Rock, J. F.* — *Hillebrand, W.* s. n. (leg. Oahu, Nuuanu, 1858) (I, 10, α, a); s. n. (Oahu, 1869 or 1870) (I, 10, β, b); s. n. (Lanai, July 1870) (I, 10, α, a); s. n. (Lanai, July 1870) (I, 10, β, a); s. n. (Maui) (I, 10, α, a); s. n. (Maui, Aug. 1870) (I, 10, β, a); s. n. (leg. 1874) (I, 10, α, a); s. n. (leg. Lanai, 1874) (I, 10, β, a); s. n. (Molokai) (I, 10, α, a); see also *Knudsen* — *Hillebrand, W. & J. M. Lydgate* s. n. (Maui) (I, 10, α, a) — *Höfer* 21 (I, 8) — *Horne* 2 (I, 11); 317 (I, 1, β); 317a (I, 1, β); 484 (IV, 3); 717 (III, 3); 1117 (III, 2) — *Hosaka, E. Y.* 665 (I, 10, α, a); 841 (I, 10, α, a); 860 (I, 10, α, a); 992 (I, 10, α, b); 1015 (I, 10, α, a) — *Hoshino* 2138 (VI, 1) — *Hume,* see *Christophersen, E.*

Inouye, R. s. n. (Nov. 5, 1933) (I, 10, α, a).

Judd A. F. 19 (I, 10, α—β); 49 (I, 10, β, a); s. n. (June 4, 1938) (I, 10, α—β).

Kajewski 43 (IV, 4); 104 (I, 1, β); 344 (III, 5); 385 (I, 4); 756 (III, 5); 771 (I, 9); 936 (I, 4); 941 (I, 9); 945 (I, 9); 1903 (III, 1); 2124 (I, 2); 2205 (IV, 2); 2399 (IV, 2) — *Kanehira, R.* 794 (III, 4); 1322 (I, 7) — *Knudsen* s. n. (Herb. Hillebrand) (I, 10, α, a) — *Kraemer* s. n. (I, 8); s. n. (V, 5) — *Krajina, V.* 122 (I, 10, α); 123 (I, 10, α); 124 (I, 10, β); 125 (I, 10, α, a); 127 (I, 10, β, a); 128 (I, 10, β, a) — *Krauss, N. H.* s. n. (Jan. 8, 1933) (I, 10, α, a); s. n. (May 14, 1933) (I, 10, α, a).

Ledermann 13299 (III, 4); 13555 (III, 4); 13796 (III, 4); 14079 (I, 8); 14364 (I, 8); 14491 (V, 5); 14510 (V, 5) — *Lindley* s. n. (I, 1, α) — *Lister, J. J.* s. n. (I, 1, β); s. n. (IV, 6) — *Lydgate, J. M.* s. n. (Kauai) (I, 10, β, a); see also *Hillebrand, W.* — *Lyon, H. L.* 6061 (I, 10, α, a).

Mann & Brigham 363 (I, 10, β) — *Marche, A.* 244 (I, 8) — *Meebold, A.* s. n. (Oahu) (I, 10, α, b); s. n. (Huehue) (I, 10, β, a); s. n. (Kilauea) (I, 10, β, b); in Herb. Degener 10663 (I, 10, β, b) — *Meinecke,* see *Cooke* — ? *Milne* 430 (V, 1, β) — *Munro, G. C.* *32* (I, 10, β, a); 52 (I, 10, α, a); 53 (I, 10, α, a); 54 and 54a (I, 10, β, a); 204 (I, 10, α, a); 244 (I, 10, β, a); 263 (I, 10, α, a); 264 (I, 10, α, a); 285 (I, 10, α, a); 392 (I, 10, β, a); 394 (I, 10, β, a); 401 (I, 10, β, a); 407 (I, 10, α, a); s. n. (Apr. 6, 1915, Haalelepaakai) (I, 10, α, a); s. n. (April 6, 1915, Kaa) (I, 10, β, a); s. n. May 12, 1915) (I, 10, β, a); s. n. (June 27, 1915) (I, 10, α, a).

Nadeaud s. n. (I, 1, β) — *Nisida, S.* 2776 (V, 5).

Pancher s. n. (V, 1, β) — *Parks, H. E. & S. Thew* 22356 (I, 1, β) — *Pelletier* 39 (V, 1, α) — *Powell, T.* 187 (V, 1, α).

Raymundus, Pater 9 (I, 8); 224 (I, 8) — *Reinecke* 177 (1, 11) — *Rémy, J.* 475 (I, 10, β, a); 476 (I, 10, α—β); 477 (I, 10, α); 478 (I, 10, α, a); 478a (I, 10, α, a) — *Rock, J. F.* (A) (I, 10, β, a); (B) (I, 10, β, a); (C) (I, 10, α, a); 1507 (= 1495) (I, 10, α, a); 1624 (= 1495) (I, 10, α, a); 2085 (I, 10, α, a); 2197 (= 1495) (I, 10, α, a); 2198 (= 1495) (I, 10, α, a); 2336 (I, 10, α—β); 3820 (I, 10, β a); 3912 (I, 10, β, a); 3971 (= 3966 = 3973) (I, 10, β, a); 5507 (= 5509) (I, 10, α, a); 5511 (= 5509) (I, 10, α, a); 5512 (= 5509) (I, 10, α, a); 6154 (I, 10, α—β); 7077 (I, 10, β, a); 8002 (I, 10, α, a); 8003 (I, 10, α, a); 8039 (I, 10, β, a); 8063 (I, 10, α, a); 8106 (I, 10, α, a); 8107 (I, 10, α, a); 8122 (I, 10, α, a); 8510 (I, 10, α, a); 8668 (I, 10, β, a); 8670 (I, 10, α, a); 8684 (I, 10, β, a); 10029 (I, 10, β, a); 10150 (I, 10, β, a); 17029 (I, 10, β, a); 17057 (I, 10, α, a); 17120 (I, 10, β, a); s. n. (Kauai, 1910) (I, 10, α, a); s. n. (Maui, Oct. 1910) (I, 10, β, a); s. n. (Kauai, Oct. 1911) (I, 10, α, a); s. n. (Puuwaawaa, March 1912) (I, 10, β, a); s. n. (Puuwaawaa or Kapua) (I, 10, β, a) — *Rock, J. F. & Hammond* 8064 (I, 10, α, a) — *Russ, G. W. & D'A Welch* s. n. (June 22, 1933) (I, 10, α, a).

Shea & Stevens s. n. (Jan., 1928) (I, 10, β, a) — *Selling, O.* 3349 (I, 10, α, a); 3365 (I, 10, β, a); 3674 (I, 10, α, a); 3689 (I, 10, α, a); see also *Cranwell, L. M.* — *Skottsberg, C.* 668 (I, 10, β, a); 1004 (I, 10, α, a); 1820 (I, 10, β, a); 1963 (I, 10, β, a); 2851 (per *J. Wichman*) (I, 10, α, a); see also *Cranwell, L. M.* — *Smith, A. C.* 82 (IV, 1); 683 (I, 1, α); 705 (I, 1, α); 920 (I, 9); 1154 (I, 1, β); 1208 (I, 1, β); 1385 (I, 1, β); 1386 (I, 1, β); 1450 (V, 4); 1453 (I, 1, β); 1461 (V, 6); 1474 (IV, 1); 1491 (I, 6); 1604 (I, 3); 1793 (III, 3); 1805 (III, 2); 1980 (IV, 5) — *Stehlin,* see *Christophersen, E.* — *Stevens,* see *Shea* — *St. John, H.* 9937 (I, 10, α, a);

10362 (I, 10, α, a); 10582 (I, 10, α, a); 10724 (I, 10, α, a); 11584 (I, 10, β, a); 11589 (I, 10, α, a); 16513 (I, 1, β); 16514 (I, 1, β); 16738 (I, 1, β); 16769a (I, 1, β).

Takamatsu, M. 1212 (I, 8); 1554 (I, 8); 1751 (V, 5) — *Thompson* 477 (I, 8) — *Thurston* s. n. (IV, 8).

U. S. South Pac. Expl. Exp. Capt. *Wilkes* s. n. (I, 1, β); s. n. (V, 1, α).

Vaupel 324 (I, 11); 341 (III, 7); 504 (IV, 6); 612 (I, 11) — *Volkens* 340 (I, 8); 533 (553?) (I, 8).

Welch, D'A. see *Russ, G. W.* — *Whitmee* 224 (I, 11); 226 (V, 3) — *Wichman, J.*, see *Skottsberg* — *Wilder, G. P.* 88 (I, 10, β, a); 455 (I, 10, α—β); 777 (I, 1, β); 950 (I, 1, β); 1115 (I, 1, β); see also *Bouchier*.

Index of latin names

Note. Accepted names in roman, synonyms in italics. New species are denoted by an asterisk. Genera and species have been indicated by their number of sequence. Only those have been enumerated, which have been quoted in the present paper. For further synonymy see our previous publications in Bull. Jard. bot. Buitenzorg, Sér. III, VII, 1925 and VIII, 1927; Nova Guinea XIV, 4, 1932; B. P. Bish. Mus. Occ. Pap. XIV, Nr. 9, 1938 and Blumea IV, nr. 2, 1941.

ACHRAS

costata Endl. (I, 1); *dissecta* L. f. (V, 1); *novo-zelandica* F. Muell. (I, 1).

BASSIA

Amicorum A. Gray (IV, excl.); *Bawun* (Scheff.) Guill. (IV, 2); *Kajewskii* Guill. (IV, 4); *obovata* Forst. (IV, 7); *Thurstonii* Hemsl. (IV, 8).

BURCKELLA

Amicorum (A. Gray) H. J. Lam (IV, excl.); *brachypoda H. J. Lam (IV, 1); Cocco (Scheff.) Pierre (IV, 2); Hillii (J. G. Baker) H. J. Lam (IV, 3); Kajewskii (Guill.) H. J. Lam (IV, 4); *macrantha H. J. Lam (IV, 5); microphylla H. J. Lam & E. v. Olden (IV, 6); obovata (Forst.) Pierre (IV, 7); Thurstonii (Hemsl.) H. J. Lam (IV, 8).

CHRYSOPHYLLUM

polynesicum Hill. (II, 2); *sandwicense* Hill. (I, 10).

DICHOPSIS

Hornei Hart. (III, 3).

HORMOGYNE

tahitensis Nad. (I, 1); *tahitensis* (Nad.) Pierre (I, 1).

ISONANDRA

polynesica Benth. & Hook. (II, 2).

LUCUMA

vitiensis (Gray) Gill. (I, 1).

MADHUCA

Amicorum (A. Gray) Macbr. (IV, excl.).

MANILKARA

dissecta (L. f.) Dub. (V, 1); emarginata H. J. Lam (V, 2); *Pancheri* (Baill.) Dub. (V, 1); samoensis H. J. Lam & B. Meeuse (V, 3); Smithiana H. J. Lam & R. Maas Geesteranus (V, 4); udoido Kan. (V, 5); vitiensis (H. J. Lam & E. van Olden) B. Meeuse (V, 6).

MIMUSOPS

dissecta R. Br. (V, 1); Elengi L. (VII, 1); *Pancheri* Baill. (V, 1).

MYRSINE

molokaiensis Lév. (I, 10).

NESOLUMA

Nadeaudii (Drake) Pierre (II, 1); polynesicum (Hill.) Baill. (II, 2); St. Johnianum H. J. Lam & B. Meeuse (II, 3).

NORTHIA

Hoshinoi Kan. (VI, 1); *vitiensis* H. J. Lam & E. van Olden (V, 6).

NORTHIOPSIS

Hoshinoi (Kan.) Kan. (VI, 1).

PALAQUIUM

amicorum Pierre (IV, excl.); *erythrospermum H. J. Lam (III, 1); fidjiense Pierre (III, 2); Hornei (Hart.) Dub. (III, 3); karrak Kan. (III, 4); *leuconeurum* H. J. Lam (III, 4); neo-ebudicum Guill. (III, 5); *oxyspermum H. J. Lam (III, 6); Stehlinii Christoph. (III, 7).

PAYENA

Hillii J. G. Baker (IV, 3).

PLANCHONELLA

aurantium (Rock) Skottsb. (I, 10); costata (Endl.) Pierre (I, 1); *densiflora* (Hill.) Pierre (I, 10); firma (Miq.) Dub. (I, 2); Garberi Christoph. (I, 3); *Garberi* Christoph. p. p. (I, 9); *Grayana* St. John (I, 1); *Guillauminii H. J. Lam (I, 4); macropoda H. J. Lam (I, 5); *Meeboldii* Baehni & Degener (I, 10); *membranacea H. J. Lam (I, 6); micronesica (Kan.) Kan. (I, 7); obovata (R. Br.) H. J. Lam (I, 8); oxyedra (Miq.) Dub. (I, 9); *paludosa* H. J. Lam (I, 11); *puulupensis* Baehni & Degener (I, 10); *Remyi* Pierre (I, 10); *samoensis* (Rein.) H. J. Lam (I, 11); sandwicensis (A. Gray) Pierre (I, 10); *spathulata* (Hill.) Pierre (I, 10); *tahitensis* (Nad.) Dub. (I, 1); torricellensis (K. Schum.) H. J. Lam (I, 11); *vitiensis* Gill. (I, 9).

RAPANEA

torricellensis K. Schum. (I, 11).

SAPOTA

costata (Endl.) A. DC. (I, 1); *pyrulifera* A. Gray (I, 9); *sandwicensis* A. Gray (I, 10); *vitiensis* A. Gray (I, 1).

SERSALISIA

costata (Endl.) Dom. (I, 1).

SIDEROXYLON

acutum Krause (I, 11); *aneityense* Guill. (I, 9); *auahiense* Rock (I, 10); *Ceresolei* Rock (I, 10); *costatum* (A. DC.) Benth. & Hook. (I, 1); *costatum* (Endl.) F. v. Muell. (I, 1); *micronesicum* Kan. (I, 7); *rhynchospermum* Rock (I, 10); *samoense* Rein. (I, 11); *sandwicense* (A. Gray) Benth. & Hook. (I, 10); *spathulatum* Hillebr. (I, 10); *tahitense* Nad. (I, 1); *tannaense* Guill. (I, 1); *vitiense* (Gray) Benth. & Hook. (I, 1); *vitiense* (Gray) Burk. (I, 1).

SUTTONIA

molokaiensis Lév. (I, 10).

A geographical list of Sapotaceous species occurring in the separate islands or island groups may be found in our earlier paper, published in the Proceedings of the Sixth Pacific Science Congress, Berkeley 1939.

ON QUANTITATIVE STATISTICAL METHODS IN TAXONOMY; SUBDIVISION OF A POLYMORPHOUS SPECIES: PLANCHONELLA SANDWICENSIS (GRAY) PIERRE

by

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> "It is an attempt to carry on consciously and mathematically the same sort of process which with a good naturalist is subconscious and unmathematical". Anderson and Abbe.

Introduction.

In his paper on Pacific Sapotaceae, Lam (4) dealt at some length with the extreme polymorphy in *Planchonella sandwicensis* (Gray) Pierre from the Hawaiian Islands. For systematical and morphological data concerning this species I may refer to that publication. In the following lines I will restrict myself to a discussion of some attempts towards a subdivision of herbarium material of the said species, using mainly quantitative, statistical methods.

I am very much indebted to Dr H. J. Lam for his stimulating support as well as for his continuous interest in the progress of my work, which have largely contributed to its eventual results. I am equally indebted to Dr J. B. D. Derksen for his critical reading of the mathematic part of the manuscript. However, full responsibility for any errors is, of course, my own.

In applying quantitative statistical methods I followed two different ways, which will be discussed in § 1 and § 2 respectively; § 3 contains an attempt to check my own results mathematically.

1. In order to subdivide the polymorphous material, I led my investigations, first of all, along the lines, suggested by Anderson and Whitaker (3, cf. also 1 and 2). The publication mentioned first is, so far as I know, the first one which treats taxonomical problems in the following way. By counting, measuring and calculating, each specimen of the material to be subdivided (into genera, species, subspecies, varieties or formae or, in general, into taxa of some kind) is given an "index". The indices, thus obtained, of course will not be all the same but will be varying within a certain range. Gaps occurring in this range, may point to taxonomic discontinuities, i. e. to natural delimitations of separate groups.

However, this interesting working hypothesis has been worked out in a way, I cannot consider unassailable. Anderson and Whitaker worked with dried material of *Uvularia grandiflora* Sm. and of *Uvularia perfoliata* L., two related, yet distinct North-American Liliaceae. Fifteen specimens (entire plants) were taken from either species and in each specimen certain measurements were made at a particular leaf, inserted at the main axis and bearing the lowest (sterile) shoot. After this, in each specimen the absolute values (a), some of their ratios (b) and the sum of the squares of these ratios (c) were compared with a, b and c of all other specimens respectively. It then appeared that in the two species the variation-ranges of the values of either a, b or c were overlapping each other, any discontinuity being, therefore, absent. However, the discontinuity demanded by the apparent specific differences showed itself — at any rate in the thirty specimens studied — if to value c was added: 1. the squared two-tenths part of the number of leaves on the main axis below the lowest branch, and 2. the squared tenth part of the difference between 10 and the number of leaves on this sterile branch.

Only a small part of the figures, leading to this rather astonishing result, have been published; rather astonishing, for it would be an exception to the rule that the sum of the squares of continuously varying numbers shows continuous variability itself. Most of the facts mentioned, however, are shown by graphic representation only. Therefore, although this cannot be proved, this "discontinuity between two species" is most probably a collective character of these thirty specimens only and may be called accidental; that is to say, as soon as the material would be enlarged with a sufficiently great number of specimens, both in what is regarded as *Uvularia grandiflora* and as *Uvularia perfoliata* a discontinuity of this kind would, most probably, be no longer apparent. Moreover, the method described seems just a little too artificial to allow trustworthy results regarding a subdivision of a living material.

In view of these considerations I would rather not apply to our material the method suggested by Anderson an Whitaker unmodified. Moreover, as our material consisted of twigs of the most different size, appearance and leafedness, it did not allow to gather the data in exactly the same way as was described above, i. e. in each specimen from any one particular leaf or any other special feature. For the sake of objectivity I had to start from average values in each specimen.

Every specimen in this material is represented by one or more twigs, bearing the most different numbers of leaves, flowers and fruits. Besides, no character of any part of a specimen, be it the shape of the leaves or the length of the pedicels etc., can be regarded to be of constant value in the twig it belongs to.

There is, on the contrary, a certain variability in all characters in the same specimen. In a given twig x, a special character p, therefore, is not sufficiently characterized by its mean value m_{px}; its variability v_{px} should be mentioned as well. In a twig y this same feature is characterized by m_{py} and v_{py}. If we want to subdivide a given material on account of a character p, this character is useful only when the following conditions are fulfilled:

1. If two twigs, x and y, are parts of one and the same specimen, any difference between m_{px} and m_{py} should not surpass a certain value dependent on v_{px} and v_{py}; if this upper limit is surpassed, the character chosen is of no use for a subdivision.

2. if x and y are hailing from two different specimens, belonging to one and the same taxonomic group (taxon), the value of m_{px} minus m_{py} may be somewhat larger than in the previous case, but still it has a distinct upper limit, depending on the variability of p within the taxon.

3. if x and y represent two different taxa, the difference mentioned must surpass this limit. A significant difference of this kind is a counterpart of the discontinuity mentioned above, but statistically it is better justified.

Moreover, a useful character p has to comply with the general condition that it must be possible to count or measure it in all specimens, since the specimens it is lacking in cannot be put in their proper places in the taxonomic system to be designed. For this reason, only characters of the stem and of the leaves are suitable, and those of flowers and fruits are to be left out of account, as in many specimens these are not extant. Therefore, the comparative research work, discussed in this paragraph, was based upon the leaves, the more so, since the astonishing diversity (cf. Lam, l. c., figs. 4—5) was most attractive in view of our purpose.

The first condition mentioned, to be fulfilled by a useful character p was that the difference $m_{px} - m_{py}$ should not surpass a certain amount, dependent on the values of v_{px} and v_{py}. As every textbook of mathematical statistics will show the mathematical basis of this thesis, I will not but recall here, that m_{px} and m_{py} are, with some reserve, considered to be representing material of an essentially different nature only, if their mutual difference is greater than its "standard error", $3\,\varepsilon\,(m_{px} - m_{py})$, a mathematical function of v_{px} and v_{py} and of the number of leaves, measured regarding the character p in the specimens x and y respectively.

Among the characters of the material at hand, I have been looking for such, as might be suitable for basing a subdivision upon. Possible items were the length of the petioles (a), the length of the lamina (b) (the length of the apex in acuminate leaves was not included), the distance from the base of the leaf to the point on the costa where the leaf is broadest (c), and the largest width of the lamina perpendicular to the costa (d).

None of the values of a, b, c or d complied with the condition mentioned above sub 1, for in some specimens not only fertile twigs with normal leaves were extant, but also sterile sucker shoots with much larger leaves, which, for the sake of objectivity, could not be left out of account. As, however, those larger leaves showed generally the same shape as the normal leaves, it seemed, a priori, not impossible that, for instance, the ratios between length and breadth should be similar or at least comparable. In view of this possibility, I choose six different ratios and calculated the average values for each twig of a set of six from the same specimen (*H. St. John 11584*). The results are given in the following table (I):

TABLE I.

Means of: specimen nr.	$\frac{b}{a}$	$\frac{c}{a}$	$\frac{d}{a}$
116a	3.0 ± 0.10	**1.78** ± 0.040	2.07 ± 0.029
116b I	**3.2** ± 0.08	1.70 ± 0.062	**2.11** ± 0.066
116b II	**2.6** ± 0.06	**1.51** ± 0.033	**1.71** ± 0.042
117a	2.9 ± 0.07	1.73 ± 0.039	1.87 ± 0.042
117b	3.2 ± 0.08	1.76 ± 0.066	1.85 ± 0.046
117c	3.0 ± 0.07	1.68 ± 0.053	1.93 ± 0.086
m_{max}—m_{min}	0.60	0.27	0.40
$3\,\varepsilon\,(m_{max}$—$m_{min})$	0.31	0.15	0.24

Means of: specimen nr.	$\frac{b}{c}$	$\frac{b}{d}$	$\frac{c}{d}$
116a	1.72 ± 0.019	1.47 ± 0.062	0.86 ± 0.015
116b I	**1.85** ± 0.052	**1.47** ± 0.036	**0.80** ± 0.014
116b II	1.70 ± 0.023	1.48 ± 0.019	0.87 ± 0.040
117a	**1.66** ± 0.024	1.55 ± 0.027	0.93 ± 0.012
117b	1.79 ± 0.046	**1.71** ± 0.030	**0.96** ± 0.030
117c	1.74 ± 0.028	1.52 ± 0.025	0.89 ± 0.023
m_{max}—m_{min}	0.19	0.24	0.16
$3\,\varepsilon\,(m_{max}$—$m_{min})$	0.17	0.14	0.10

Here again a, b, c and d are dimensions of leaf-parts as mentioned above. In each category of ratios the largest (m_{max}) and the smallest (m_{min}) average value have been printed in heavy type and the difference (m_{max}—m_{min}) has been recorded underneath. This shows that each of these differences is greater than the amount of $3\,\varepsilon\,(m_{max}$—$m_{min})$. Thus, none of the ratios used is in compliance with the first condition mentioned above and is, therefore, of any use as a criterion for subdividing this polymorphous material.

Beside its shape there is yet another character of the leaf showing a considerable variability, viz. the angle between the midrib and the lateral nerves, which is varying between 40° and 90°. As the angles at the base of the leaves are always greater than those near the apex, I choose to measure two particular angles, α and β, situated at $^1/_3$ and $^2/_3$ of the length of the costa from the leaf-base. In this way I measured α and β in the leaves of six twigs from one single specimen (*J. F. Rock 8684*) and calculated the average values of α, β and α/β for each of these twigs. The results may be seen from the following table (II):

TABLE II.

Means of: specimen nr.	α	β	$\frac{\alpha}{\beta}$
129a	**6°09** ± 1°31	**4°225** ± 1°13	**1.45** ± 0.033
129b	6°455 ± 0°54	**5°10** ± 0°91	**1.27** ± 0.027
129c	6°33 ± 1°19	4°41 ± 1°446	1.45 ± 0.025
129d	**6°585** ± 1°07	4°79 ± 0°82	1.38 ± 0.030
129e	6°475 ± 0°73	4°585 ± 3°05	1.42 ± 0.039
131	6°185 ± 1°23	4°47 ± 1°45	1.40 ± 0.043
$\mathrm{m}_{\max}-\mathrm{m}_{\min}$	0°495	0°875	0.18
$3\,\varepsilon\,(\mathrm{m}_{\max}-\mathrm{m}_{\min})$	0°507	0°435	0.13

In each category the largest ($\mathrm{m}_{\max}$) and the smallest ($\mathrm{m}_{\min}$) value has been printed in heavy type, the difference ($\mathrm{m}_{\max}-\mathrm{m}_{\min}$) being recorded underneath. Each of these differences is greater than the value of $3\,\varepsilon\,(\mathrm{m}_{\max}-\mathrm{m}_{\min})$, except in α, but this case is not very striking, since the two values are almost the same. Thus, the values of the various angles measured, provides no suitable criterion either for a subdivision of the material.

After this second failure I stopped looking for a criterion of this kind and I made another attempt along a quite different line in order to solve, if possible, the problem of the subdivision of a polymorphous material on the basis of statistical methods.

2. My second attempt was based upon the following working hypothesis. If, in a polymorphous material, there are specimens with certain morphological characters in an extreme condition (in the following to be called extremes) and others, having these characters in an intermediate condition (to be called intermediates), the procentual number of the latter is showing to which degree the former, although being morphologically opposite, may be considered to belong together, in other words: in how far the phases of the characters in question may be considered to represent the various materializations of one and the same genotypical variation.

If the number of intermediates between two groups of extremes is small, the two groups may be considered distinct. If, on the other hand, the intermediates are numerous, there is no ground to base separate groups on the extremes. Once the groups being determined, each specimen may be inserted in its proper place or taxon on the basis of the characters used.

Our starting point for working out this scheme consisted of five pairs of opposite characters, viz.

The surface of the leaf-blade, being large (*a*) or small (*b*);

The shape of the leaf, being obovate-oblong (*c*) or acute (acuminate)-rhomboid (*d*);

the pedicels, being long (*e*) or short (*f*);

the sepals, being rounded (*g*) or acute (*h*);

the fruits, being rounded (*i*) or acute (*j*).

From each pair of characters, in the sequence mentioned, one is applicable to a specimen. In case of doubt both figures are to be used. Such a doubt may arise, both when the part concerned is missing and when it is in an intermediate condition [1].

In this way every specimen may be represented by a formula, e. g. a twig with large (*a*) round-shaped (*c*) leaves, long (*e*) pedicels and rounded (*g*) sepals, but acute (*j*) fruits by the formula *a c e g j*. Another specimen, showing the first four characters in the same condition but possessing no fruits, by $a\,c\,e\,g\genfrac{}{}{0pt}{}{i}{j}$. A third example, for the greater part equal to the preceding one, but leaving doubt as to the interpretation of the length of the pedicels, by $a\,c\genfrac{}{}{0pt}{}{e}{f}g\genfrac{}{}{0pt}{}{i}{j}$.

Every combination of characters without intermediate factors, i. e. all extremes, the formulae of which may be composed out of the five pairs of characters mentioned, have been inserted in the following table (III) and have been designated by a capital:

TABLE III.

A	*a c e g i*	I	*a d e g i*	Q	*b d e g i*	Y	*b c e g i*
B	*a c e g j*	J	*a d e g j*	R	*b d e g j*	Z	*b c e g j*
C	*a c e h j*	K	*a d e h j*	S	*b d e h j*	AA	*b c e h j*
D	*a c e h i*	L	*a d e h i*	T	*b d e h i*	BB	*b c e h i*
E	*a c f h i*	M	*a d f h i*	U	*b d f h i*	CC	*b c f h i*
F	*a c f h j*	N	*a d f h j*	V	*b d f h j*	DD	*b c f h j*
G	*a c f g j*	O	*a d f g j*	W	*b d f g j*	EE	*b c f g j*
H	*a c f g i*	P	*a d f g i*	X	*b d f g i*	FF	*b c f g i*

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[1] Which condition may be called intermediate? After some time's survey of the entire material this question answered itself. Yet, I am afraid that some absurdities, showing themselves in the results of this investigation and mentioned later on were partly caused by an erroneous interpretation of this intermediate condition. If this investigation could have been repeated, slightly altered as to this point, I suppose these absurdities would disappear to a large extent.

According to this table, the examples given above agree with the combinations B, (A or B) and (A, B, G or H) respectively.

All combinations (formulae) actually represented in our material are mentioned in the following table (IV). In this table all of the 143 ¹) specimens (some of the 177 numbered, afterwards proved to be duplicates) are divided into two categories, one comprising the extremes, the other containing the intermediates; the latter has been divided into groups of combinations with one, two, three or four intermediate factors respectively. Of each combination in this table the first item is its formula. Next follow one or more capitals designating this formula and the numbers of the specimens represented by this formula.

TABLE IV.

Extremes*:*

acegi — **A** — 9, 11, 13, 14, 16, 20, 23, 25C, 27, 28, 29, 39, 41, 42, 43, 45, 49, 51, 52, 57, 59, 70, 75, 78, 79, 81, 83, 84, 85, 89, 93, 96, 97.

acfhi — **E** — 104, 118, 119

acfhj — **F** — 129, 162

acfgj — **G** — 125

acfgi — **H** — 99, 106, 127

adfhj — **N** — 144

bdfhj — **V** — 155, 158, 167, 171

adfgj — **O** — 102

bcegi — **Y** — 21

bcfgi — **FF** — 132, 134, 154

Intermediates (with one, two, three and four characters in an intermediate condition):

$aceg^{i}_{j}$ — (**A** or B) — 3*, 4*, 7*, 19*, 24*, 25A*, 37*, 60*, 61*, 69*, 74*, 88*, 92*, 152*, 10?, 30?, 46?, 62?, 63?, 64?, 65?, 73?, 112?

$ace^{g}_{h}i$ — (**A** or **D**) — 72?

$ac^{e}_{f}gi$ — (**A** or **H**) — 31?, 34?, 66?, 122?

$a^{c}_{d}egi$ — (**A** or I) — 86?, 90?

${}^{a}_{b}cegi$ — (**A** or **Y**) — 12?, 22?

$acfh^{i}_{j}$ — (**E** or **F**) — 115*, 116*, 124*

${}^{a}_{b}dfhi$ — (*M or U*) — 128?

$adfh^{i}_{j}$ — (M or **N**) — 145*, 146*, 161?

${}^{a}_{b}dfhj$ — (**N** or **V**) — 170?

$b^{c}_{d}fhj$ — (**V** or DD) — 169?

$b^{c}_{d}ehj$ — (*S or AA*) — 101?

? Doubtful regarding condition of one or more pairs of characters.
* Fruits wanting.
A, E, F, etc. Component of a combination also occurring as an "extreme".
M or U Neither component of this combination is found among the "extremes".
For further explanation see text.

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¹) This number is somewhat smaller than that mentioned in Lam's paper (160) as some specimens were not received on loan but after the present paper was secluded.

TABLE IV (continued).

$acf^{g}_{h}i$ — (**E** or **H**) — 130?
$a^{c}_{d}fgi$ — (**H** or **P**) — 105?, 120?
${}^{a}_{b}cfgi$ — (**H** or **FF**) — 147?
$ad^{e}_{f}gj$ — (J or **O**) — 98?

$bc^{e}_{f}gi$ — (**Y** or **FF**) — 150?
$bdfg^{i}_{j}$ — *(W or X)* — 107*, 139*
$bcfg^{i}_{j}$ — (EE or **FF**) — 137*
$bcfh^{i}_{j}$ — *(CC or DD)* — 166*

ace^{gi}_{hj} — (**A**, B, C or D) — 1?, 176? 5*, 47*
$ac^{e}_{f}g^{i}_{j}$ — (**A**, B, **G** or **H**) — 2*
$a^{c}_{d}eg^{i}_{j}$ — (**A**, B, I or J) — 8*, 44*, 54*
$ac^{eg}_{fh}i$ — (**A**, D, **E** or **H**) — 17?
$a^{c}_{d}fh^{i}_{j}$ — (**E**, **F**, M or **N**) — 163B*
adf^{gi}_{hj} — (M, **N**, **O** or P) — 126*?
acf^{gi}_{hj} — (**E**, **F**, **G** or **H**) — 135?

${}^{a}_{b}c^{e}_{f}gj$ — (B, **G**, Z or EE) — 113?
$b^{c}_{d}fh^{i}_{j}$ — (U, **V**, CC or DD) — 164*, 165* 172*, 173*
$bc^{eg}_{fh}j$ — *(Z, AA, DD or EE)* — 149?
$bc^{e}_{f}g^{i}_{j}$ — (**Y**, Z, EE or **FF**) — 153?
$ad^{e}_{f}g^{i}_{j}$ — (I, J, **O** or P) — 177?
$b^{c}_{d}fg^{i}_{j}$ — (W, X, EE or **FF**) — 123A?, 138? 141?, 100*

ac^{egi}_{fhj} — (**A**, B, C, D, **E**, **F**, **G** or **H**) — 18†, 25B†, 26†, 58†, 68†, 77†
$a^{c}_{d}f^{gi}_{hj}$ — (**E**, **F**, **G**, **H**, M, **N**, **O** or P) — 123B?
$a^{ce}_{df}g^{i}_{j}$ — (**A**, B, **G**, **H**, I, J, **O** or P) — 114*?
ad^{egi}_{fhj} — (I, J, K, L, M, **N**, **O** or P) — 6†, 103†? 136†

a^{cegi}_{dfhj} — (**A**, B, C, D, **E**, **F**, **G**, **H**, I, J, K, L, M, **N**, **O** or P) — 15†?
b^{cegi}_{dfhj} — (Q, R, S, T, U, **V**, W, X, **Y**, Z, AA, BB, CC, DD, EE or **FF**) — 157†?
${}^{a}_{b}c^{egi}_{fhj}$ — (**A**, B, C, D, **E**, **F**, **G**, **H**, **Y**, Z, AA, BB, CC, DD, EE or **FF**) — 143†?
${}^{ac}_{bd}f^{gi}_{hj}$ — (**E**, **F**, **G**, **H**, M, **N**, **O**, P, U, **V**, W, X, CC, DD, EE or **FF**) — 140?

? Doubtful regarding condition of one or more pairs of characters.
* Fruits wanting.
† Sterile specimens (flowers and fruits wanting).
For further explanation see p. 53.

This table shows that the combinations A and (A or B) are numerically best represented and this concentration of specimens is still corroborated by combining both groups of specimens, since

1^0 combination (A or B) means, properly speaking, a transition between A and B. However, as A is representing a great number of specimens and B none at all, this condition can hardly be called an intermediate one, but can better be considered lying within the variation-range of combination A.

2^0 in many specimens, possessing both older and younger fruits, the latter show some degree of acuteness (in the formula: $\genfrac{}{}{0pt}{}{i}{j}$), whilst the former, as a matter of course, whether rounded (*i*) or acute (*j*), are perfectly decisive. As the combination (A or B) meaning doubt as to the condition of the fruits (in the nrs. 10?, 30?, 46? etc.), often showed this $\genfrac{}{}{0pt}{}{i}{j}$ character in small fruits, it is not impossible, that these fruits would have got a rounded shape (character *i*), had they been allowed to ripen (cf. Lam, l. c., pp. 28 and 30).

This correction, bringing together all specimens characterized by *acegi* and $aceg\genfrac{}{}{0pt}{}{i}{j}$, gives rise to a sort of nucleus, consisting of $33 + 23 = 56$ specimens, i. e. 39 % of the entire material. All other combinations of characters are more or less distinctly connected with this nucleus. On the other hand, combination V (*bdfhj*), representing 4 specimens, has nothing in common with it, being directly opposite to it. Less different of it are, of course, those combinations, that have in common all characters but one.

Of this latter kind five different combinations, B, D, H, I and Y, may be indicated. In the same way five other combinations can be found, each of them different from B only as to one single character, viz. the combinations A, C, G, J and Z. The combinations that have most characters in common with combination D are C, A, E, L and BB. In general, each combination out of those, included in table III, has five others differing from it as to one of its characters only. Symbolizing each of these "single differences" by a distance of constant length all 32 combinations could be arranged in a three-dimensional diagram. However, if we consider only those combinations occurring as extremes, a two-dimensional diagram will suffice. In the scheme, shown in *Fig. 1* (p. 56), O and G, G and F, F and E, etc., each differing from the other as to one single character, show the same mutual distance, both horizontally and vertically.

In *Fig. 1* an application is demonstrated of our working hypothesis, already mentioned on page 51. Considering two groups of extremes differing only as to one single pair of opposite characters and, besides, a group of intermediates, only being in an intermediate condition as to the opposite characters in question, the morphological difference between the two groups of extremes mentioned may be called insignificant, if the number of intermediates mentioned is relatively large; it may, on the other hand, be called significant, if the said number is relatively small or if it is nought. In the former case the two groups belong together from a morphological point of view.

Let me take as an example the groups of extremes characterized as A and as H, differing as to the length of the pedicels only. The first group, consisting of 33 specimens, has long, the second group, comprising 3 specimens, possesses short pedicels. In addition, a group of 4 specimens is characterized by (A or H), the length of their pedicels being doubtful. As this number of four specimens is relatively large (group H including only three), the different length of the pedicels in A and H is not to be called a significant point of distinction.

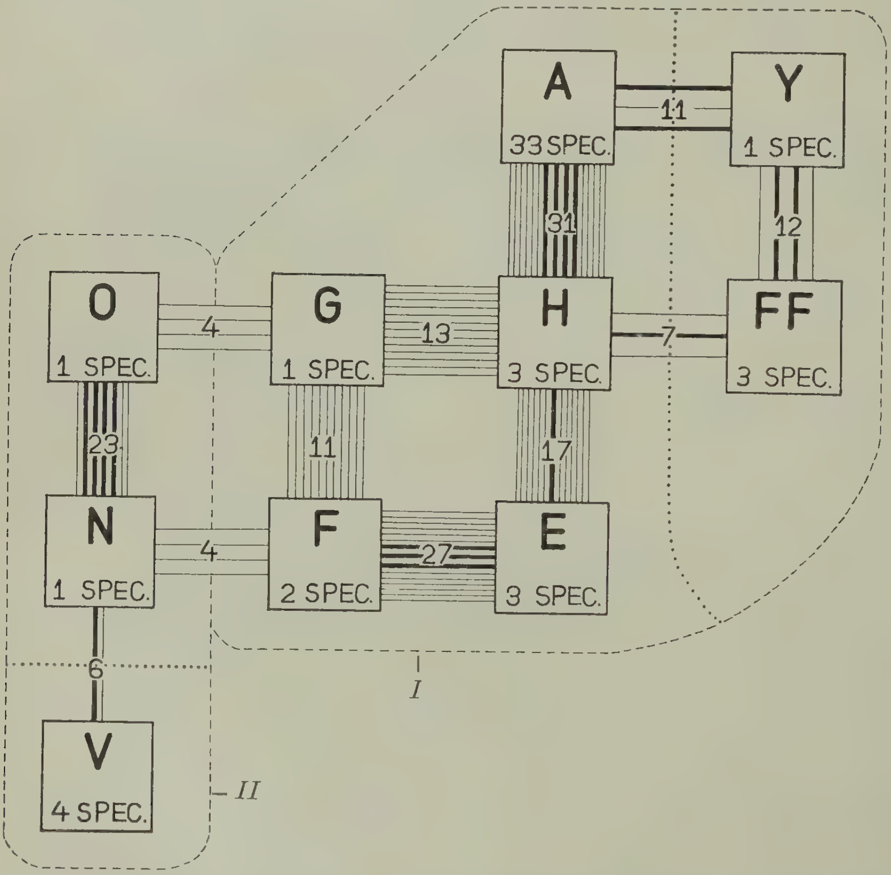

Fig. 1 — Arrangement of 10 combinations (extremes) according to their natural relations as shown by the number of their direct (heavy lines) and indirect (thin lines) intermediates, which connect them.

These four specimens, establishing, in a way, a bridge between A and H, are indicated by four heavy lines in the scheme mentioned. However, as a matter of fact, there are many other specimens, forming some sort of connection between A and H, viz. those, characterized by (A, B, G or H), by (A, D, E or H), by (A, B, C, D, E, F or H) etc., all including A and H as components in their combinations of characters. Of course, each of these does not indicate as strong a connection between A and H as the specimens of (A or H). Therefore, in the scheme the graphic representation of each specimen of this kind is by a thin line between A and H. But not as a thin line between A and H only. The other components of the said combinations of characters had also to be connected by thin lines, if possible, i. e. if occurring in our scheme. A specimen, for instance, characterized by (A, B, G or H) is indicated by one thin line between A and H and another between G and H, not, however, by a thin line between A and G, two combinations which are not to be connected directly, since they are different in more than one category of characters.

Out of this procedure all heavy and thin lines resulted, which are shown in *Fig. 1.* A simple calculation, based upon the principle of the "weighted mean", but not specified in this notice, shows, that one heavy line symbolizes as strong a "connection" between two combinations (the capitals in the scheme) as five thin lines. On this calculation the totals between the combinations are based. Considering this, it seems acceptable to divide the scheme into at least two parts, the first consisting of O, N and V, the second comprising E, F, G, H, A, Y and FF. Though it is evident, that a strict disjunction is not in the nature of this material, the mutual connection (shown in the number of connecting lines between the capitals) within either part is undoubtedly more evident than the connection between the two parts. In other words, the "intrapartial" connection is stronger than the "interpartial" one. Other, though weaker delimitations lie between A—H and Y—FF, and also between N and V.

Between the two main groups, to be called *II* (including the capitals O, N and V) and *I* (including the other seven combinations of characters) the most striking difference concerns the shape of the leaf, that is the pair of characters $\frac{c}{d}$, since the character c (leaves obovate-oblong) is extant in group *I* without any exception, and is entirely lacking in group *II*. Just as in the arrangement, composed by Lam (4, fig. 4), it is shown here, that the shape of the leaf is a valuable criterion for a subdivision in *Planchonella sandwicensis* ¹), the other characters mentioned giving rise to homologous variations within either group.

This being stated, a number of questions arise. Are we right in dividing all 143 specimens (not to mention other specimens, not represented in this material) either into group *I* or into group *II*, on account of the shape of the leaves only? And if so, is this sufficiently justified by the mutual relations of only 40 % of the material at hand, the number of extremes comprised in our scheme being not more than 52 (out of 143)? Are the specimens, which are intermediate as to the shape of their leaves, i. e. characterized by $\frac{c}{d}$, to be considered also actually intermediate between

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¹) This statistical result needs, of course, not contradict Lam's choice of the length of the pedicels for a practical subdivision.

the groups? Questions like these I will reply to with the aid of a statistical check, to be described in the next paragraph.

3. The 143 specimens of the material may be grouped, regarding the size and the shape of the leaves, the length of the pedicels and the shape of the sepals and fruits, in 50 different combinations of characters, and each specimen is, concerning the characters mentioned, completely determined by one of these combinations.

As yet, we restricted ourselves to a distribution of these combinations to the groups *I* and *II*, only regarding the condition of the second pair of characters, i. e. the shape of the leaf (*c* and *d*). Each *c* has been put into group *I*, each *d* into group *II*, and each $\genfrac{}{}{0pt}{}{c}{d}$ is considered an intermediate. In this way all other characters are considered homologous variations and, therefore, of no importance for a subdivision. If this procedure is correct, these other characters will be equally distributed to the groups *I* and *II*, i. e. group *I* will, proportionally speaking, comprise as many specimens with one of these characters (for instance *b*) as group *II*.

This means, that, if in group *I* the numbers of specimens, showing character *a*, $\genfrac{}{}{0pt}{}{a}{b}$ or *b* (*a* and *b* are representing the size of the leaf) are, for instance, 50, 10 and 30 respectively and in group *II* these numbers are 20, 4 and 12 (that is in the same proportion), these characters are to be considered homologous variations. If, however, the proportions in the two groups are not the same, for instance 50, 10, 30 and 6, 4, 26 respectively, the distribution of these characters cannot be considered a homologous variation, but is significantly different within the two groups and is, therefore, of real importance for a subdivision.

Though this conclusion is admissable only in case many specimens are available, I checked its consequences in a purely quantitative way in the 143 specimens at hand. It must be admitted that the results of this investigation will be infavourably biased by this relatively small number; I hope, therefore, that this method may some time be applied to a more extensive material.

Group *I* includes 4 times the combination V (*b d f h j*), once the combination N (*a d f h j*) and once the combination O (*a d f g j*). This means that character *a*, being present in N and O only, is represented in two specimens of this group, i. e. (the total number of specimens in group *II* being six) in 33.3 %; in the same way character *b* shows a percentage of 66.7. Character *c* is, naturally, extant in 0 % and character *d* in 100 % of the specimens of this group, and the characters *e* and *f* show the same figures. For *g*, extant in combination O (one single specimen) and for *h* in V and N (including 5 specimens together), they are 16.7 % and 83.3 % respectively. Finally, the characters *i* and *j* are extant in 0 % and 100 % of the specimens in group *II* respectively.

Summarizing the relative significance of each of the characters, after having been calculated in this way, it is found that:

$$II = \begin{matrix} 33.3\,\%\ a & 0\,\%\ c & 0\,\%\ e & 16.7\,\%\ g & 0\,\%\ i \\ 66.7\,\%\ b & 100\,\%\ d & 100\,\%\ f & 83.3\,\%\ h & 100\,\%\ j \end{matrix}$$

The figures concerning group *I* may be calculated in the same way, leading to the following results:

$$I = \begin{matrix} 91.3\,\%\ a & 100\,\%\ c & 73.9\,\%\ e & 89.1\,\%\ g & 93.5\,\%\ i \\ 8.7\,\%\ b & 0\,\%\ d & 26.1\,\%\ f & 10.9\,\%\ h & 6.5\,\%\ j \end{matrix}$$

I think, that a further accumulation of figures may be interrupted here and that the introduction of a simple cipher-key will open the door to the well-known ground of systematics. The formulae given may then be interpreted in the following way:

Group *I*: leaves chiefly (91.3 %) large, shape of the leaves always (100 %) obovate-oblong,
pedicels mostly (73.9 %) long,
sepals mostly (89.1 %) rounded,
fruits almost always (93.5 %) rounded.

Group *II*: leaves chiefly (66.7 %) small, always (100 %) of acute (acuminate)-rhomboid shape,
pedicels always (100 %) short,
shape of the sepals mostly (83.3 %) acute,
shape of the fruits always (100 %) acute.

In these terms the same is expressed as in the formulae given above, namely a "synthetic description" of the groups *I* and *II*. As the distribution of characters not concerning the shape of the leaf is by no means proportionally the same within these groups, it is obvious that the four characters in question are not to be considered homologous variations; they are of some more taxonomic importance.

Now every specimen, represented by five characters as shown above, may be compared with either of these "synthetic" groups *I* and *II*. With a purely quantitative method any given specimen of *Planchonella sandwicensis* may be stated to have more or less in common either with group *I* or with group *II*.

This method of allocation may be demonstrated with a specimen, characterized by $a\,c\,f\,\genfrac{}{}{0pt}{}{g\,i}{h\,j}$, i. e. with the combination (E, F, G or H). If we could dispose of 100 specimens of the same type, the characters *a*, *c* and *f* would be encountered 100 times, and the characters *b*, *d* and *e* never. It may, therefore, be said, that the leaf is $\genfrac{}{}{0pt}{}{100\,\%\ a}{0\,\%\ b}$, the leafshape is $\genfrac{}{}{0pt}{}{100\,\%\ c}{0\,\%\ d}$ and the pedicels are $\genfrac{}{}{0pt}{}{0\,\%\ e}{100\,\%\ f}$. But as both the shape of the sepals and of the fruits are subject to doubt, in one half of cases we should be inclined to call them rounded (*g* and *i* respectively) and in the other half acute (*h* and *j* respectively). Thus the formula $\genfrac{}{}{0pt}{}{g\,i}{h\,j}$ may also be written as $\genfrac{}{}{0pt}{}{50\,\%\ g\quad 50\,\%\ i}{50\,\%\ h\quad 50\,\%\ j}$. The entire formula may then be written thus: $\begin{matrix} 100\,\%\ a & 100\,\%\ c & 0\,\%\ e & 50\,\%\ g & 50\,\%\ i \\ 0\,\%\ b & 0\,\%\ d & 100\,\%\ f & 50\,\%\ h & 50\,\%\ j \end{matrix}$, in which way even one single specimen is as perfectly characterized, as 100 specimens would be.

This implies, that if one specimen shows a character in an intermediate condition, for instance $\frac{i}{j}$, 50 out of 100 of the same type are to be considered i and 50 j. In the case of the "synthetic groups", however, some characters are not in an intermediate condition, but they are not entirely pure either. As the leaf in group *I*, for instance, is mostly large (91.3 %), this means that 913 out of 1000 specimens of group *I* may be expected to be large-leafed and the other 87 small-leafed. In 1000 specimens of the combination (E, F, G or H), however, all thousand have large leaves. Of either group of 1000 specimens, therefore, 913 possess the same kind of leaves, viz. large ones, which means that there is a conformity of 91.3 % of the two groups of 1000 specimens.

Considering the shape of the leaf in specimens of the combination (E, F, G or H) and of group *I* the conformity is total (100 %), for in 1000 specimens of either type all thousand have rounded leaves.

As to the pedicels, out of 1000 specimens of group *I*, 739 are to be considered long-pedicellate and the other 261 short-pedicellate. In 1000 specimens of the type $a\,c\,f\,\frac{g\,i}{h\,j}$, however, all have short pedicels. The conformity of the two groups of 1000 specimens is, therefore, only 26.1 %, since 261 specimens of either group show the same character b.

Considering the shape of the sepals in 1000 specimens of both types mentioned, the specimens with rounded and with acute sepals would be 891 and 109 in number respectively in group *I*, and 500 and 500 respectively in the type of the combination (E, F, G or H). The conformity of both groups, therefore, concerns firstly 109 specimens showing the character g and secondly 500 specimens showing the character h, or in total 609 specimens or 60.9 %.

As to the fruits, in a material of 1000 specimens of group *I*, 935 specimens would possess more or less rounded fruits and 65 specimens would have more or less acute ones. Of 1000 specimens of the combination (E, F, G or H), however, fruits with rounded and with acute tips would be found in equal numbers (500 of each category); and 500 specimens with rounded fruits are also equally extant in the first-named group, but since only 65 specimens in this group have acute fruits, the conformity of the two groups is 565 specimens or 56.5 %.

The conformity with reference to five different pairs of characters, however, may be stated not only in groups of 1000 specimens of either kind, but is also existing in their single representatives. In fact, the groups of 1000 specimens were only mentioned in order to elucidate our explanation.

The foregoing considerations show that the conformity of a specimen, characterized by $a\,c\,f\,\frac{g\,i}{h\,j}$ and a specimen of group *I* was found to be

91.3 % concerning the leaf,
100 % concerning the shape of the leaf,
26.1 % concerning the length of the pedicels,

60.9 % concerning the shape of the sepals, and
56.5 % concerning the shape of the fruit.

The "average procentual conformity" (A. P. C.) is the average of these five amounts, viz. 67 %. This means that a specimen characterized by $a\,c\,f\,\genfrac{}{}{0pt}{}{g}{h}\genfrac{}{}{0pt}{}{i}{j}$ may be considered to belong to group *I*, although the A. P. C. is not greater than $^2/_3$ of the total similarity.

In the same way its A. P. C. may be calculated with regard to group *II*. It then proves to be 50 %. This means that a specimen characterized by $a\,c\,f\,\genfrac{}{}{0pt}{}{g}{h}\genfrac{}{}{0pt}{}{i}{j}$ cannot be considered to belong to group *II*, for although it has exactly one half of its characters in common with that group (its A. P. C. being 50 %), the A. P. C. with group *I* is greater (67 %).

Now the A. P. C. with group *I* and group *II* has been calculated for all specimens in the material at hand. In Table V these figures have been given in the fourth and fifth columns respectively. The sixth column indicates whether the specimens have ultimately been inserted in group *I* or in group *II*. The second column contains the formulae of the specimens (combinations of characters), the third one the number of specimens representing these formulae in the material.

It appears from this table that in the majority of the cases, in which the character *c* is occurring, the A. P. C. with group *I* is greater than that with group *II*, and that, whenever the character *d* is extant the *II* percentage is greater. Predomination of the A. P. C. with *II*, in case the

TABLE V.

Conformity of 50 combinations of characters with regard to group *I* and group *II*.

Nr.	Formula	Number of specimens	Average Procentual Conformity (A. P. C.)		Group
			with *I*	with *II*	
	Extremes				
1	*a c e g i*	33	89.6	10.0	*I*
2	*a c f g i*	3	80.0	30.0	*I*
3	*a c f h i*	3	64.4	43.3	*I*
4	*a c f g j*	1	62.6	50.0	*I*
5	*a c f h j*	2	47.0	63.3	*II*
6	*a d f h j*	1	27.0	83.3	*II*
7	*a d f g j*	1	42.6	70.0	*II*
8	*b d f h j*	4	10.4	90.0	*II*
9	*b c f g i*	3	63.5	36.7	*I*
10	*b c e g i*	1	73.1	16.7	*I*

TABLE V (continued).

Nr.	Formula	Number of specimens	Average Procentual Conformity (A. P. C.)		Group
			with *I*	with *II*	
	Single Intermediates				
11	$aceg^{i}_{j}$	23	82.2	20.0	*I*
12	$ace^{g}_{h}i$	1	83.9	20.0	*I*
13	$ac^{e}_{f}gi$	4	90.0	20.0	*I*
14	$a^{c}_{d}egi$	2	79.6	20.0	*I*
15	${}^{a}_{b}cegi$	2	83.0	20.0	*I*
16	$acfh^{i}_{j}$	3	57.0	53.3	*I?*
17	$acf^{g}_{h}i$	1	74.4	40.0	*I*
18	$a^{c}_{d}fgi$	2	70.0	40.0	*I*
19	$ad^{e}_{f}gj$	1	52.6	60.0	*II?*
20	$adfh^{i}_{j}$	3	37.0	73.3	*II*
21	${}^{a}_{b}dfhj$	1	20.4	93.3	*II*
22	${}^{a}_{b}dfhi$	1	38.1	73.3	*II*
23	${}^{a}_{b}cfgi$	1	73.5	40.0	*I*
24	$b^{c}_{d}ehj$	1	30.0	60.0	*II*
25	$bc^{e}_{f}gi$	1	73.5	26.7	*I*
26	$b^{c}_{d}fhj$	1	20.4	80.0	*II*
27	$bdfg^{i}_{j}$	2	36.1	66.7	*II*
28	$bcfg^{i}_{j}$	1	56.1	46.7	*I*
29	$bcfh^{i}_{j}$	1	40.4	60.0	*II*
	Complex Intermediates				
30	ace^{gi}_{hj}	4	76.5	30.0	*I*
31	$ac^{e}_{f}g^{i}_{j}$	1	82.6	30.0	*I*

TABLE V (continued).

Nr.	Formula	Number of specimens	Average Procentual Conformity (A. P. C.)		Group
			with *I*	with *II*	
32	$a\,\substack{c\\d}\,e\,g\,\substack{i\\j}$	3	72.2	30.0	*I*
33	$a\,c\,\substack{e\,g\\f\,h}\,i$	1	84.4	30.0	*I*
34	$a\,\substack{c\\d}\,f\,h\,\substack{i\\j}$	1	47.0	63.3	*II*
35	$a\,c\,f\,\substack{g\,i\\h\,j}$	1	67.0	50.0	*I*
36	$b\,\substack{c\\d}\,f\,h\,\substack{i\\j}$	4	30.4	70.0	*II*
37	$\substack{a\\b}\,c\,\substack{e\\f}\,g\,j$	1	50.4	50.0	*?*
38	$b\,c\,\substack{e\,g\\f\,h}\,j$	1	50.4	56.7	*II?*
39	$b\,c\,\substack{e\\f}\,g\,\substack{i\\j}$	1	66.1	36.7	*I*
40	$a\,d\,\substack{e\\f}\,g\,\substack{i\\j}$	1	62.6	50.0	*I*
41	$b\,\substack{c\\d}\,f\,g\,\substack{i\\j}$	4	46.1	56.7	*II*
42	$a\,c\,\substack{e\,g\,i\\f\,h\,j}$	6	77.0	40.0	*I*
43	$a\,\substack{c\\d}\,f\,\substack{g\,i\\h\,j}$	1	57.0	60.0	*II?*
44	$a\,\substack{c\,e\\d\,f}\,g\,\substack{i\\j}$	1	72.6	40.0	*I*
45	$a\,d\,\substack{e\,g\,i\\f\,h\,j}$	3	57.0	60.0	*II?*
46	$a\,\substack{c\,e\,g\,i\\d\,f\,h\,j}$	1	67.0	50.0	*I*
47	$b\,\substack{c\,e\,g\,i\\d\,f\,h\,j}$	1	50.4	56.7	*II?*
48	$\substack{a\\b}\,c\,\substack{e\,g\,i\\f\,h\,j}$	1	70.4	50.0	*I*
49	$\substack{a\,c\\b\,d}\,f\,\substack{g\,i\\h\,j}$	1	60.4	70.0	*II*
50	$a\,d\,f\,\substack{g\,i\\h\,j}$	1	47.0	70.0	*II*

character c is extant is found only in the nrs. 5 (2 specimens), 29 (1 specimen), and 38 (1 specimen). Predomination of the A. P. C., in case the character d is extant, is found only in nr. 40 (1 specimen). As out of 101 specimens with the character c only 4 specimens (4 %) have less conformity with group *I* than with group *II* and as out of

19 specimens with the character *d* only 1 specimen (this cannot be said to be 5 %, as the number concerned is too small) show less conformity with group *II* than with group *I*, it may be concluded that, on the whole, a subdivision according to the shape of the leaf is justified by a quantitative check. Only in cases of doubt as to the shape of the leaf, this quantitative check does not justify the allotment of an intermediate position between the groups, for, firstly, the 23 cases of $\genfrac{}{}{0pt}{}{c}{d}$ include only 9 % (two specimens) showing nearly equivalent *I* and *II* conformity and, secondly, these two specimens (nrs. 43 and 47) form only 19 % of the total number of specimens with equivalent *I* and *II* conformity. As to the subdividing criterion used by Lam (4, fig. 5) in his demonstrative arrangement of specimens of *Planchonella sandwicensis*, on account of the length of the pedicels, their condition $\genfrac{}{}{0pt}{}{e}{f}$ is found only seven times among the eleven specimens with equivalent *I* and *II* conformity and out of (in total) 25 cases of $\genfrac{}{}{0pt}{}{e}{f}$ only 28 % (7 specimens), show equivalent *I* and *II* conformity.

In conclusion, it may be stated that, on the whole, this quantitative check proves fairly well that the shape of the leaves is a useful criterion for subdividing *Planchonella sandwicensis*, though it is, evidently, not suitable for locating the cases in the demarcation zone, i. e. the specimens to be placed between the two groups (subspecies or varieties). But this would undoubtedly be to high a demand for a mathematical method applied to living material.

Summary.

An attempt has been made to subdivide a very polymorphous plant species by means of a quantitative statistical method. This method has been based upon the following working hypothesis: 1° as some morphological characters of the material, concerning e. g. the shape of the leaves, the length of the pedicels etc., show an extremely great variation, each of these characters in every specimen at hand may be stated to be in one of three (one intermediate and two extreme) conditions; 2° if a character happens to be in an intermediate condition in a relatively great number of specimens the difference between the extreme conditions of that character may be considered insignificant from a taxonomical point of view; 3° the fewer characters of two or more specimens are differing significantly (in the way mentioned), the more reason there is to consider those specimens to belong together; and, on the contrary, the more numerous the significant differences are, the more reason there is to distribute the specimens to two (or more) different groups.

On the basis of this working hypothesis the material at hand, consisting of 143 specimens (all considered to belong to the Sapotaceous *Planchonella sandwicensis*, which was discussed in a paper by Lam), could be subdivided into two different groups. Five characters were chosen, each allowing to state one intermediate and two opposite extreme conditions. Of

these the shape of the leaf proved to be a most important criterion for a subdivision. After this had been stated, a purely quantitative check was made which largely endorsed the result.

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NOTES ON JAVANESE VERBENACEAE

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(Issued June 15th, 1942).

On preparing the manuscript of the Verbenaceae for Dr C. A. Backer's "Flora van Java" it appeared to me that — in comparison with the monographic treatments of this family by Lam (5) and by Lam & Bakhuizen van den Brink (6) — several changes in the nomenclature and in the interpretation or delimitation of certain species are urgent. Although, considered in the light of more recent work on this family as it occurs in adjacent regions (2, 3, 8), a new critical revision of the Malaysian Verbenaceae seems desirable, we have to refrain from such a task, which would require a greater deal of investigation than the present author is able to afford at the time. Hence these notes are merely intended to account for the discrepancies between the treatment of the javanese species as they will appear in the afore-mentioned flora and as they are given in the recent monographs (5, 6). Still, they may prove to be a first contribution towards another revision covering the whole of Malaysia.

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I. The genus Garrettia in Malaysia.

On re-examining the specimens which have previously been described as *Vitex cymarioides* (cf. H. J. Lam and A. Meeuse in Blumea 3, 248, 1939), it became obvious that on account of the structure of the fruit this species cannot possibly belong to the genus *Vitex*, in which it had been placed with some doubt. The fruit characters indubitably indicate that it has to be transferred from the tribe of the *Viticoideae* to that of the *Caryopteridoideae*. Further investigation showed that the plant possesses all essential characters of the genus *Garrettia* Fletcher (cf. Kew Bull. Misc. Inf. 1937, 71), of which hitherto only a single species had been described, viz. *Garrettia siamensis* Fletcher (Siam).

Nearly all specific characters of *G. siamensis* perfectly agree with those of the plant described as *Vitex cymarioides*, but we hesitate to unite these two species on account of the following differences:

Character:	*Garrettia siamensis* [1])	*Garrettia cymarioides*
Inflorescence	dichotomously or trichotomously branched	bifurcate
Corolla lobes	glandular within	not so
Throat of corolla tube	without hairs	with a strip of rather long hairs at side of lower lip
Stamens	didynamous, the longer exsert	subequal, not or hardly exsert
Filaments	only at the very base with long hairs, glabrous for the rest, not glandular	villous and covered with stalked glands in lower half, glabrous and covered with sessile glands higher up [2])
Anthers	minutely papillose	smooth
Ovary	glabrous	densely and completely covered with glands
Distribution	North Siam	some islands near E. Java: Kangean Isl., Bawean, and Madoera

Since the type specimen of *Garrettia siamensis* is inaccessible at the time being, we cannot decide what value may be attributed to the above differences, but as far as we are able to judge, the plants certainly represent two distinct species, so that the following new combination has to be made: **Garrettia cymarioides** (H. J. Lam & A. Meeuse) A. Meeuse, nov. comb. — *Vitex cymarioides* H. J. Lam & A. Meeuse in Blumea 3, 248 (1939). — *Cymaria triphylla* Backer MS [1]).

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[1]) After Fletcher from his description and figure.

[2]) This was not clearly indicated in the original description, but cf. Blumea 3, p. 249, fig. 1 h.

II. On the identity of Verbena javanica Burm. f.

The status of N. L. Burman's *Verbena javanica,* described in his "Flora Indica" and reported to occur in Java, remained doubtful for a long time. Nevertheless, this species was transferred to at least four different genera, viz. to *Blairia* by Gaertner, to *Zapania* by Lamarck, to *Lippia* by Sprengel and, finally, to *Phyla* by Moldenke. Except Gaertner, who must have examined Burman's type (having made an analysis of the flower and of the fruit), these authors apparently did not study the original specimen.

In order to solve this problem we have studied a leaf and an inflorescence of the type specimen, now preserved in the Delessert Herbarium at Geneva, which we obtained on loan through the courtesy of the director of the Geneva Herbarium, Prof. B. P. G. Hochreutiner. To him we are greatly indebted for his readiness to forward these fragments as well as a pencil sketch of the specimen.

The investigation proved that *Verbena javanica* belongs to the genus *Lippia* L. and that it is identical with the species, commonly known as *Lippia asperifolia* A. Rich. An older synonym of the latter is *Lippia alba* (Mill.) N. E. Br., based on *Lantana alba* Mill. (1768). Now that Burman's *Verbena javanica* appears to be conspecific with Miller's *Lantana alba,* the interesting question arises which specific name should be maintained, as both species were published in the same year. We were not able to decide which publication is the older one, the only date available being "1768". Accordingly, the oldest combination based on one of these names which was made in the genus *Lippia* has priority. This appears to be *Lippia javanica* (Burm. f.) Spreng. (1825), which invalidates *Lippa alba* (Mill.) N. E. Br. (1925), though unfortunately the specific epitheton "javanica" is quite inappropriate, for the plant does not occur in Java at all (see below). This leads to the following synonymy:

Lippia javanica (Burm. f.) Spreng., Syst. 2, 1825, 752; Schau. in DC. 593; Lam, Verb. 19 and in Rev. sub *L. asperifolia*; Merrill in Phil. Journ. Sci. 19, 1921, 376. — *Verbena javanica* Burm. f., Fl. Ind. 12, 1768, t. 6, f. 2. — *Lantana alba* Mill., Gard. Dict. Ed. 8, 1768. — *Verbena globiflora* L'Hér., Stirp. Nov. 23, 1786, t. 12. — *Zapania odoratissima* Scop., Delic. Fl. & Faun. Insub. 1, 1786, 34, t. 15. — *Blairia javanica* (Burm. f.) Gaertn. Fruct. 1, 265—266, 1788, t. 56. — *Zapania lantanoides* Lamk., Tabl. Encycl. Meth. Bot. 1, 1791, 58. — *Zapania javanica* (Burm. f.) Lamk. l. c. 59. — *Zapania globiflora* (L'Hér.) Willd., Spec. Pl. 1, 1797, 116. — *Verbena capensis* Thunb., Prodr. Fl. Cap., 1800, 96. — *Lantana lavandulacea* Willd.,

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[1]) Duplicates distributed by the Buitenzorg Herbarium under this provisional name.

Sp. Pl. 3, 1800, 319. — *Lippia asperifolia* A. Rich. ex Marthe, Cat. Pl. Jard. Méd. Paris 1801, 67. — *Zapania globiflora* A. L. Juss., Ann. Mus. Hist. Nat. Paris 7, 1806, 72. — *Zapania odorata* Pers., Syn. Pl. 2, 1806, 140. — *Lippia geminata* H. B. K., Nov. Gen. & Sp. Pl. 2, 1818, 266. — *Lantana geminata* (H. B. K.) Spreng., Syst. 2, 1825, 763. — *Lippia capensis* (Thunb.) Spreng. l. c. 751. — *Phyla javanica* (Spreng.) Moldenke in Herter, Rev. Sudamer. Bot. 5, 1938, 2.

Lippia javanica has, if ever, never been collected in Java again. Burman received his information from correspondents and, moreover, he received a great deal of his specimens from David Kleinhof, who lived at Batavia from 1741 or 1742 to 1762, where he cultivated many plants in his garden, including species not indigenous in Java, but nevertheless subsequently labelled "Kleinhof, Java" in Burman's herbarium.

The actual type specimen is of unknown origin, but an identical specimen, also in the Herb. Burman, bearing the name "*Verbena javanica*" in Burman's hand-writing, is labelled "Kleinhof, Java", in an unknown hand-writing ¹). This may have misled Burman and it would seem that the locality cited in the "Flora Indica" is an error.

III. Miscellaneous nomenclatural corrections.

Lantana L.

Lantana Camara L., Sp. Pl. Ed. 1, 1763, 627; Schau. in DC. 606; Merrill, Enum. 380; Backer & v. Sl., Handb. Jav. Theeonkr. 1924, 187; Backer, Onkruidfl. Jav. Suikerrietgr. 7, 1934, 541; Dop in F. G. I. C. 779 — *L. aculeata* L., l. c. 627; Hall. f., Ergebn. 17; Lam, Verb. 12 and in Rev. 4; Ridley, F. M. P. 612; Fletcher, Siam. Verb. 410.

L. aculeata was for the first time recognized as a synonym of *L. Camara* by Schauer, so that the name *L. Camara* should be retained.

Phyla Lour.

Phyla Lour. is distinct from *Lippia* L., but was generally regarded as a synonym. For the delimitation of these two genera we refer to E. L. Greene in Pittonia 4, 1899, 45—46.

Phyla nodiflora (L.) Greene l. c. 46; Moldenke in Lilloa 4, 1939, 296—297 — *Verbena nodiflora* L., Sp. Pl. Ed. 1, 1753, 20 — *Lippia nodiflora* (L.) A. Rich. in Michx., Fl. Am. Bor. 2, 1803, 15; Hall. f., Ergebn. 19; Lam, Verb. 16 and in Rev. 5; Merrill, Enum. 381; Ridley, F. M. P. 612; Backer, Onkruidfl. Jav. Suikerrietgr. 7, 1934, 543 (var. *sarmentosa* only); Dop in F. G. I. C. 780; Fletcher, Siam. Verb. 410 — *Phyla sinensis* Lour., Fl. Cochinch. 1790, 66.

Stachytarpheta Vahl

Stachytarpheta cayennensis (L. C. Rich.) Vahl, Enum. 1, 1804, 208 ("*cajanensis*"); Hall. f., Ergebn. 20; Lam, Verb. 21 (in syn.) and in

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¹) This information was kindly provided by Prof. Hochreutiner.

Rev. 6 (in syn.); Danser in Ann. Jard. Bot. Buitenz. 40, 1929, 2—3 — *Stachytarpheta dichotoma* (haud Vahl) Backer in Ann. Jard. Bot. Buitenz. Suppl. 3, 1, 1910, 415; Koorders, Exk. Fl. Java 3, 1912, 133; Lam, Verb. 21 and in Rev. 6.

Stachytarpheta jamaicensis (L.) Vahl l. c. 206; Hall. f., Ergebn. 21; Lam, Verb. 22, pro parte; Ridley, F. M. P. 613; Merrill, Enum. 381, pro parte; Backer and v. Sl., Handb. Jav. Theeonkr. 1924, 188; Danser l. c. 7—8; Backer, Onkruidfl. Jav. Suikerrietgr. 7, 1934, 546; Dop in F. G. I. C. 783, pro parte; Fletcher, Siam. Verb., pro parte — *St. indica* var. *jamaicensis* (L.) Trimen, Handb. Fl. Ceylon 3, 1895, 348 — *St. jamaicensis* var. *typica* H. J. Lam in Rev. 6.

Stachytarpheta indica (L.) Vahl, l. c. 206; Trimen, l. c. exclus. var.; Hall. f., Ergebn. 20; Ridley, F. M. P. 613, Backer & v. Sl., l. c. (in nota); Danser, l. c. 5—6 — *Stachytarpheta jamaicensis* var. *indica* (L.) H. J. Lam in Rev. 7 — *St. jamaicensis* (L.) Vahl, Lam, Verb. 22, pro parte; Merrill, Enum. 380, pro parte; Dop in F. G. I. C. 783, pro parte; Fletcher, Siam. Verb. 411, pro parte.

The two last-named species are often considered conspecific, but may be easily distinguished as follows:

1a. Leaves usually obovate or even more or less spathulate, pale green in a living state, drying very pale, not or only slightly bullate, not or scarcely rugose; secondary and tertiary nervation not prominent below. Basal margin of medial leaf serrations at least twice as long as apical margin. Acumen of bract much shorter than the membrane-edged lower part. Corolla light bluish-violet . . . . **St. indica** (L.) Vahl

b. Leaves ovate to elliptic-oblong, dark green in a living state, drying dark brown, manifestly bullate and rugose, secondary and tertiary nervation prominent below. Basal margin of medial leaf serrations less than twice as long as apical margin. Acumen of bract at least as long as the membrane-edged lower portion. Corolla deep bluish-violet . . . . **St. jamaicensis** (L.) Vahl

Duranta L.

Duranta repens L. Sp. Pl. Ed. 1, 637 (1753); Merrill, Enum. 381 — *Duranta Plumieri* Jacq. (1763), Lam, Verb. 27 and in Rev. 8; Dop in F. G. I. C. 784; Fletcher, Siam. Verb. 411.

Geunsia Blume

This genus was combined with *Callicarpa* L. by Bakhuizen van den Brink (cf. Rev. 9). In our opinion, however, it should be maintained, a view which is also held by Ridley, Fletcher and others. For the delimitation of these two genera we refer to Hallier, Ergebn. 23 and to Lam, Verb. 29—30.

Geunsia pentandra (Roxb.) Merrill, Phil. Journ. Sci. Bot. 11, 1916, 309; Lam, Verb. 33; Fletcher, Siam. Verb. 415 — *Callicarpa pentandra* Roxb., Fl. Ind. 1, 1820, 409; Bakh. in Rev. 11; Merrill, Enum. 387 — *Geunsia farinosa* Bl., Bijdr. 1826, 819; Lam, Verb. 42; Ridl., F. M. P. 614.

It remains to be seen, whether the various species of *Geunsia*, described by Hallier (l. c. 24—32), Lam and others, which were all reduced to *Callicarpa pentandra* by Bakhuizen van den Brink, actually belong here. In our opinion, at least part of them represent distinct species, but a detailed investigation is necessary before a definite conclusion can be drawn.

Callicarpa L.

Callicarpa rubella Lindl., Bot. Reg. 1825, t. 883; Lam in Hall. f., Ergebn. 34 and Verb. 53; Dop in F. G. I. C. 796; Moldenke in Fedde, Rep. 40, 1936, 102; Fletcher, Siam. Verb. 414 — *C. cuspidata* Roxb., Bakh. in Rev. 23, pro parte, quoad syn. *C. rubella.*

Callicarpa tomentosa (L.) Murray, Syst. Veg. Ed. 13, 1774, 130; Moldenke, l. c. 106 — *Tomex tomentosa* L., Sp. Pl. Ed. 1, 1753, 118 — *Callicarpa lanata* L., Mant. 2, 1771, 331; Lam, Verb. 79; Fletcher, Siam. Verb. 413 — *C. tomentosa* (L.) Murr. var. *lanata* (L.), Bakh. in Rev. 22.

Callicarpa candicans (Burm. f.) Hochr., Candollea 5, 1934, 190 — *Urtica candicans* Burm. f., Fl. Ind., 1768, 197 (err. typ. 297) — *Callicarpa cana* L., Mant. 2, 1771, 198; Lam, Verb. 68; Dop in F. G. I. C. 793; Moldenke, l. c. 109; Fletcher, Siam. Verb. 413 — *C. cana* var. *typica* Bakh. in Rev. 20 — *C. candicans* var. *typica* (Bakh.) Hochr., l. c. 190.

Urtica candicans Burm. f. was placed by Weddell (in DC., Prodr. 16, 1859, 613) as a doubtful synonym of *Boehmeria nivea* (L.) Gaudich. var. *candicans* Wedd. It was pointed out by Hochreutiner, however, that Burman's type specimen is identical with the species currently known as *Callicarpa cana* L. Linné's name has, therefore, to be replaced by that of Burman.

Premna L.

Premna timoriana Decsne., Lam, Verb. 119 and in Rev. 37 (excl. syn. *Pygmaeopremna humilis* Merrill).

Pygmaeopremna humilis was referred to *Premna timoriana* by Lam in Rev. 37, but is a distinct species. Merrill (Enum. 390) considered it a synonym of *Premna herbacea* Roxb. Junell (Zur Gynäceummorphologie und Systematik der Verbenaceen und Labiaten, Symb. Bot. Upsal. 4, 1934, 85) regards *Premna herbacea* and *Pygmaeopremna humilis* as separate species, at the same time transferring them to the genus *Tatea* F. v. Muell., so that they became **Tatea herbacea** (Roxb.) Junell and **Tatea humilis** (Merrill) Junell respectively.

P. timoriana may turn out to be only a form of *P. corymbosa* (Burm. f.) Rottl. et Willd., occurring in dry regions and is treated as such in the "Flora van Java".

Premna capitata A. Meeuse, nom. nov. — *Premna macrophylla* H. J. Lam, Verb. Mal. Arch. etc. 1919, 148—149 and in Bull. Jard. Bot. Buitenz. Sér. III, 3, 1921, 43, non *Premna macrophylla* Wall., nec A. Cheval.

The specific name "*macrophylla*" used by Lam is antedated by *P. macrophylla* Wall. Cat. nr. 1765, which, though published as a nomen nudum, was validated by Schauer in DC. in 1847 (l. c., 636), so that Lam's species had to be renamed. We chose the specific epitheton "*capitata*" on account of its capitate stigmatic lobes.

Premna grandifolia A. Meeuse, nom. nov. — *Premna macrophylla* A. Cheval. ex Hutch. et Dalz., Fl. W. Trop. Afr. 2, 1931, 272; A. Cheval. in Expl. Bot. Afr. Occ. Franç. 1, 1921, 505, nomen, non *Pr. macrophylla* Wall. ex Schau., nec H. J. Lam.

Premna macrophylla A. Cheval., like the preceding at first appearing as a nomen nudum, but published by Hutchinson and Dalziel later on, is also invalidated by *P. macrophylla* Wall. ex Schau. and had to be renamed as well.

Premna corymbosa (Burm. f.) Rottl. et Willd. in Ges. Nat. Fr., Neue Schr. 4, 1803, 87; Lam, Verb. 117; Fletcher, Siam. Verb. 418 — *Premna integrifolia* L., Mant. 2, 1771, 252; Hall. f., Ergebn. 37; Lam, Verb. 140 and in Rev. 42; Ridley, F. M. P. 619; Dop in F. G. I. C. 818 — *Pr. serratifolia* L., Mant. 2, 1771, 253; Trimen, Handb. Fl. Ceylon 3, 1895, 352 — *Pr. foetida* Reinw. ex Bl., Bijdr. 816, 1826; Hall. f., Ergebn. 38; Ridley, F. M. P. 619; Fletcher, Siam. Verb. 418 — *Pr. obtusifolia* R. Br., Prodr. 1810, 512; Merrill, Interpr. Rumph. Herb. Amboin. 1917, 450 [1]) and Enum. 293 — *Pr. leucostoma* Miq., Fl. Ind. Bat. 2, 1856, 899; Lam, Verb. 149 and in Rev. 43 — *Pr. nitida* K. Schum., Fl. Kaiser Wilh.-land 1889, 121; Merrill, Interpr. Rumph. Herb. Amboin. 1917, 451 — *Premna corymbosa* var. *angustior* (C. B. Clarke) Fletcher, Siam. Verb. 419 — *Pr. integrifolia* var. *angustior* C. B. Clarke in Hook. f., Fl. Br. Ind. 4, 1885, 572; Dop in F. G. I. C. 819 — *Pr. corymbosa* var. *minor* (Ridley) Fletcher, Siam Verb. 419 — *Pr. integrifolia* var. *minor* Ridley, F. M. P. 619 — *Pr. corymbosa* var. *obtusifolia* (R. Br.) Fletcher, Siam. Verb. 419 — *Pr. integrifolia* var. *obtusifolia* (R. Br.) P'ei, Verb. China 75; Dop in F. G. I. C. 820 — *Cornutia corymbosa* Burm. f., Fl. Ind. 1768, 132, t. 141, f. 1 — *Gumira littorea* Rumph., Herb. Amb. 3, 1743, 209, t. 134 — *Folium hircinum* Rumph., Herb. Amb. 1743, 3, 208, t. 133.

Merrill (Interpr. 450—451) pointed out that Linné's *Premna integrifolia* is based on *Cornutia corymbosa* Burm. f., so that the correct name for Linné's species is *Premna corymbosa* (Burm. f.) Rottl. & Willd. Linné cites as synonym Rumphius's *Folium hircinum* and *t. 134* (instead of *t. 133*), thus starting the confusion between *Pr. corymbosa*, *Pr. integrifolia* and *Pr. serratifolia*. Now that we consider all these names as synonyms, there is no difficulty at all and the oldest valid name (*corymbosa*) holds for the whole group of forms.

Hallier (l. c. 38) already noticed the great resemblance between forms of "*Pr. foetida*" and "*Pr. integrifolia*" and stated that they could hardly, if ever, be separated. He suggested that they might be identical. Lam went still further and united them, at the same time including several other species. Although later on several authors have tried to distinguish these (or sometimes even more) species again, there is, in my opinion, not a single character which can be used to separate them. Typical "*foetida*" is certainly quite distinct from typical "*serratifolia*" or "*integrifolia*", but when a fair amount of specimens is examined, a continuous series of intermediate forms between the extremes is found, so that they cannot be considered specifically different. We fully agree with Lam, that it is even impossible to distinguish sharply defined varieties and that it is preferable to divide the species in a number of "types" (cf. Lam in Rev. 42—43).

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[1]) Lam in Rev. 42 erroneously cites Merrill Interpr. under *P. integrifolia* L.

Premna parasitica Bl., Bijdr., 1826, 816; C. B. Clarke in Hook. f., Fl. Br. Ind. 4, 1886, 574; Lam, Verb. 112—113 and in Rev. 36 — *Pr. trichostoma* Miq., Fl. Ind. Bat. 2, 1856, 892; Lam, Verb. 128—129 and in Rev. 128; Ridley, F. M. P. 620; Fletcher, Siam. Verb. 418.

Premna pubescens Bl., Bijdr., 1826, 816; Lam, Verb. 152 and in Rev. 44 — *Pr. nervosa* Koord. et Val., Bijdr. Booms. Java 7, 1910, 186; Lam, Verb. 186 and in Rev. 41—42.

Premna oblongata Miq., Fl. Ind. Bat. 2, 1856, 893; Lam, Verb. 127 and in Rev. 38 — *Pr. oblongifolia* Merr., in Phil. Gov. Lab. Bull. 29, 1905, 118; Lam, Verb. 129 and in Rev. 39; Merrill, Enum. 392.

Vitex L.

Vitex trifolia L., var. **simplicifolia** Cham. in Linnaea 1832, 107; Hall. f., Ergebn. 41 — *V. trifolia* var. *unifoliolata* Schau. in DC. 683; Lam, Verb. 182 and in Rev. 53; Dop in F. G. I. C. 835 — *V. trifolia* var. *obovata* Benth., Fl. Austr. 5, 1876, 67 — *V. trifolia* L., var. *ovata* (Thunb.) Makino in Bot. Mag. Tokyo 17, 1903, 192; Merrill, Enum. 397; Fletcher, Siam. Verb. 432 (*V. ovata* Thunb., Fl. Jap. 1784, 257) — *V. trifolia* var. *repens* Ridley, F. M. P. 631 (*V. repens* Blanco, Fl. Filip. 1837, 513).

Chamisso's name "*simplicifolia*" has priority, being the first valid publication of the name of the variety. It is not invalidated by the name "*ovata*", though *Vitex ovata* of Thunberg, which was published as a specific name, is older.

Vitex pubescens Vahl, Symb. 3, 1794, 85; Lam, Verb. 183 and in Rev. 53; Merrill, Enum. 396; Ridley, .F M. P. 632; Dop in F. G. C. I. 824; Fletcher, Siam. Verb. 435 — *V. latifolia* Lamk., Encycl. 2, 1788, 613; Hall. f., Ergebn. 44, non Mill.

Lamarck's name, though older than Vahl's *Vitex pubescens*, is invalidated by *Vitex latifolia* Mill. (1768).

Vitex quinata (Lour.) F. N. Will. in Bull. Herb. Boissier, Sér. II, 5, 1905, 431; Merrill, Enum. 396; Dop in F. G. I. C. 833; Fletcher, Siam. Verb. 434 — *V. heterophylla* Roxb., Hort. Beng. 1814, 46, nomen nudum and Fl. Ind. 3, 1832, 75; Lam, Verb. 187 and in Rev. 55; Ridley, F. M. P. 633; Fletcher, Siam. Verb. 434 — *Vitex celebica* Koord. in Meded. 's Lands Plant. 19, 1898, 560; Lam, Verb. 211 and in Rev. 56 — *Cornutia quinata* Lour., Fl. Cochinch. 1790, 387.

We are of the opinion held by most authors, viz. that *V. quinata* and *V. heterophylla* are synonyms. The first name, being the oldest, should be maintained.

Gmelina L.

Gmelina elliptica Sm. in Rees, Cyclop. 16, 1810—1811, no. 2; Merrill, Enum. 399 — *Gm. villosa* Roxb., Hort. Beng. 1814, 46, nomen nudum and

Fl. Ind. 3, 1832, 86; Lam, Verb. 217; Ridley, F. M. P. 623; Dop in F. G. I. C. 846; Fletcher, Siam. Verb. 423 — *Gmelina asiatica* L. var. *villosa* (Roxb.) Bakh. in Rev. 70; K. Heyne, Nutt. Pl. Ned. Indië Ed. 2, 1320 (1927).

Bakhuizen van den Brink made this species a variety of *Gm. asiatica* L., but we prefer to maintain it as a distinct species. *Gm. elliptica* was combined with *Gm. villosa* by Schauer in DC. Prodr. 11, 1847, 679, so that the species is now commonly known as *Gm. villosa* Roxb., but Smith's name is older and should be maintained.

Clerodendrum (Burm. ex) L.

Clerodendrum inerme (L.) Gaertn., Fruct. 1, 1788, 271; Lam, Verb. 251; Bakh. in Rev. 77; Merrill, Enum. 401; Ridley, F. M. P. 624; Dop in F. G. I. C. 854; Fletcher, Siam. Verb. 426 — *Clerodendron neriifolium* Wall., Cat.1828, no. 1789; Schau. in DC. 660; Fletcher, Siam. Verb. 425 — *Clerodendron Commersonii* (Poir.) Spreng., Syst. 2, 1825, 758 — *Volkameria inermis* L., Sp. Pl. Ed. 1, 1753, 637 — *Volkameria Commersonii* Poir. in Lamk., Encycl. 8, 1808, 688.

Cl. inerme and *Cl. neriifolium* cannot be regarded as distinct species, for they are linked by a continuous series of intermediate forms.

Clerodendrum nutans Wall. ex D. Don, Prodr. Fl. Nepal. 1825, 103; Wall. Cat. 1828, no. 1793 and in Bot. Mag. 1831, t. 3049; Hall. f., Ergebn. 72; Bakh. in Rev. 81, excl. syn. *Cl. penduliflorum* Wall. — *Clerodendron laevifolium* Bl., Bijdr. 1826; Lam, Verb. 266.

In Java only in a cultivated state.

Clerodendrum disparifolium Bl., Bijdr. 1826, 809; Hall. f., Ergebn. 73; Lam, Verb. 250; Ridley, F. M. P. 625; Fletcher, Siam. Verb. 426 — *Clerodendron laevifolium* Bakh., in Rev. 80, non Blume.

Clerodendrum eriosiphon Schau. in DC. 662; Backer in De Trop. Nat. 5, 1916, 92; Hall. f., Ergebn. 73 — *Clerodendron calamitosum* L., Lam, Verb. 256—257, pro parte — *Clerodendron disparifolium* Bakh. in Rev. 83, non Blume.

Bakhuizen van den Brink misinterpreted Blume's species *Cl. laevifolium* and *Cl. disparifolium*. A study of Blume's specimens in Herb. L.-B. showed, that *Cl. laevifolium* is a synonym of *Cl. nutans* Wall., a plant which occurs in Java only in a cultivated state, though Blume apparently erroneously states, that it occurs in primary forests on Mt. Salak and Mt. Gedeh. A study of the type of *Cl. disparifolium* Bl. reveals, that this is Bakhuizen van den Brink's "*Cl. laevifolium*". The name *Cl. disparifolium* was used by Bakhuizen van den Brink for a third species, viz. *Cl. eriosiphon* Schau. (which is mentioned by him as a synonym).

Clerodendrum incisum Klotzsch var. **macrosiphon** (Hook. f.) Baker, in This.-Dyer, Fl. Trop. Afr. 5, 1900, 308; Bakh. in Rev. 80 — *Clerodendron macrosiphon* Hook. f. in Bot. Mag. 1883, t. 6695; Backer in De Trop. Nat. 5, 1916, 87.

Clerodendrum premnoides A. Meeuse, nom. nov. — *Clerodendron macrosiphon* (Baker) Pieper in Engl. Bot. Jahrb. 62, 1928, Beibl. 80, non Hook. f. — *Premna macrosiphon* Baker ex Henriques in Bolet. Soc. Brot.

10, 1892, 148; Baker in This.-Dyer Fl. Trop. Afr. 5, 1900, 290; Hutch. et Dalz., Fl. W. Trop. Afr. 2, 1931, 270 & 272.

Clerodendron macrosiphon Pieper, based on *Premna macrosiphon* Baker from W.-Africa, is invalidated by *Cl. macrosiphon* Hook. f. and had to be renamed.

Clerodendrum phyllomega Steud., Nomencl. Ed. 2, 1, 1840, 383; Schau. in DC. 674; Miquel, Fl. Ind. Bat. 2, 1856, 878; Koord., Exk. fl. v. Java 3, 1912, 139 — *Clerodendron macrophyllum* (haud Sims) Bl., Bijdr. 1826, 809; Hall. f., Ergebn. 73; Lam, Verb. 282; Bakh. in Rev. 81.

Cl. macrophyllum Bl. (1826) is invalidated by *Cl. macrophyllum* Sims, Bot. Mag. 1825, t. 2536 (= *Cl serratum* [L.] Moon).

Clerodendrum Buchanani (Roxb.) Walp., Rep. 4, 1844, 108; C. B. Clarke in Hook. f., Fl. Br. Ind. 4, 1885, 596; Bakh. in Rev. 91 — *Volkameria Buchanani* Roxb., Hort. Beng. 1814, 46, nomen nudum, and in Fl. Ind. 3, 1832, 60 — *Clerodendron Buchananii* Herb. Roxb. ex Wall., Cat. 1828, no. 2653, nomen nudum — *Clerodendron infortunatum* (haud L.) Bl., Bijdr. 1826, 811 — *Clerodendron fallax* Lindl., Bot. Reg. 30, 1844, t. 19, fig. 2; Walp., Rep. 4, 1844, 108 — *Clerodendron Blumeanum* Schau. in DC. 669; Hall. f., Ergebn. 78; Lam, Verb. 299 — *Petasites agrestis* Rumph., Herb. Amb. 6, 1743, t. 49.

Roxburgh's *Volkameria Buchanani* was described from specimens which were "received from Dr. Buchanan at Luckipore where the plant is found wild" and "afterwards received from the Moluccas" (Roxb. l. c.). This species was combined with *Clerodendrum foetidum* by D. Don in his Prodr. Fl. Nepal. 103 (1825), but, as was pointed out by C. B. Clarke, this reduction was incorrect, for Roxburgh described *V. Buchanani* as an erect shrub with cordate leaves, the flowers in terminal corymbs and the corolla tube five or six times longer than the calyx, whereas Don's species (the type of which is extant in the British Museum ex herbario Hamilton) proved to be identical with *Caryopteris grata* Benth. and Hook. f. [1]) and is a climbing shrub with elliptic leaves, axillary inflorescences and the corolla tube shorter than the calyx lobes.

According to Clarke, Roxburgh's type specimen (Wall. Cat. no. 2653) is not in the Herb. Wallich, which seems to indicate that it is lost. From the study of the plate in Roxb. Icon. Ined. at Kew, Clarke was able to conclude that there is no reason to believe that *Volkameria Buchanani* has ever been found in Nepal or in Br. India and suggests that it is a "species from Celebes and the Moluccas". We may conclude from this that Roxburgh's statement "received from the Moluccas" holds true.

Hallier in Ergebn. 83 mentioned *V. Buchanani* as a doubtful synonym of *Clerodendron Rumphianum* De Vr. ex Miq., but this is certainly an error, for the last-named species has glabrous leaves covered with many small scales below, more or less elongated inflorescences and the corolla tube only up to twice as long as the calyx, whereas Roxburgh stated that the leaves are downy, and that the inflorescence is a corymb.

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[1]) On account of the priority the correct name for this species is *Caryopteris foetida* (D. Don) Thellung.

Bakhuizen van den Brink identified it with the species afterwards described as *Clerodendron Blumeanum* by Schauer, but he did not give any reason for this reduction.

In our opinion, Schauer's *Cl. Blumeanum* is indeed the only species occurring in the Moluccas to which Roxburgh's ample description is applicable; especially the small calyx is characteristic, further the cordate, pubescent leaves and the corolla lobes which are all turned to one side.

In the reduction of *Petasites agrestis* to *Cl. Buchanani* we follow Hallier and Bakhuizen van den Brink. Merrill, in Interpr. Rumph. Herb. Amb. 455 (1917), identified it with "*Clerodendron speciosissimum* Paxt.“ (= *Clerodendrum speciosissimum* Van Geert), but this is an error. Robinson's specimen (Reliquiae Robinsonianae no. 303) from Amboina, regarded by Merrill as representing *Petasites agrestis* and determined by him as *Clerodendron speciosissimum* Paxton, in fact is *Clerodendron Blumeanum* = *Clerodendrum Buchanani*. *Cl. speciosissimum* is a native of Java and Madoera and is found elsewhere only in a cultivated state, whereas both *Petasites agrestis* and the species of Robinson 303 are said to grow wild in abundance in Amboina.

Clerodendrum Petasites (Lour.) A. Meeuse, nov. comb. — *Volkameria Petasites* Lour., Fl. Cochinch. 2, 1790, 388, excl. syn. Rumph. — *Clerodendron viscosum* Vent., Jard. Malm. 1803, t. 25; Walp., Rep. 4, 1844, 108; Hall. f., Ergebn. 63; Bakh. in Rev. 90 (excl. syn. *Cl. confusum* Hall. f., see Rev. Addit. II—III); P'Ei, Verb. China 130 — *Clerodendron infortunatum* L., Schau. in DC. 667, pro parte; Miq., Fl. Ind. Bat. 2, 1856, 876, pro parte; C. B. Clarke in Hook. f., Fl. Br. Ind. 4, 1885, 594, excl. syn. *Cl. viscosum*; *Cl. infortunatum* (haud L., nec Bl., nec Lindl.) Lam, Verb. 284—285; Dop in F. G. I. C. 859; Fletcher, Siam. Verb. 430.

The nomenclature of this species, currently known as "*Clerodendron infortunatum*“ is rather intricate. *Clerodendrum infortunatum* L., Sp. Pl. Ed. 1, 1753, 637 was — judging from Linné's references to Hermann (Mus. Zeyl., 1717, 25, 29) and to Burman (Thes. Zeyl. 1737, 66, t. 29) in Sp. Pl. and in his Flora zeylanica 1748, 104, no. 232 — based on Ceylon material either from the Herb. Hermann, or received from Burman. Anyhow, it is obvious that the name of *Clerodendrum infortunatum* L. should be reserved for the Ceylon species, which was extensively described later on by Trimen in Handb. Fl. Ceylon 3, 1893, 361 and which is apparently endemic in Ceylon. Gaertner, in Fruct. 1, 1788, 271, t. 57, f. 1, described the fruit also from Ceylon material (extant in H. L.-B.).

Another species described as *Clerodendron viscosum* by Ventenat is quite distinct from *Cl. infortunatum*, but was often confused with it (cf. Hallier l. c. 63—65). It has a rather wide geographical distribution, ranging from Br. India and South China to the Malay Peninsula, Sumatra and Java. Loureiro's binomial *Volkameria Petasites* was based on *Petasites agrestis* Rumph., Herb. Amb. 6, 1743, 108, t. 49, but his description was from a different plant, so that he actually described a new species. This species was combined with *Clerodendrum viscosum* by Walpers and Bakhuizen van den Brink, with "*Cl. infortunatum*“ (inclus. *Cl. viscosum*) by Schauer and with "*Cl. infortunatum*“ = *Cl. viscosum* by Dop. Loureiro's statement "Hab. in dumetis Cochinchinae“, indicates that *Volkameria*

Petasites is some wild Indo-Chinese species. In our opinion, the only species occurring in these regions to which Loureiro's description is applicable, is *Cl. viscosum* Vent. However, Loureiro's name antedates Ventenat's, so that this necessitates a new combination.

Cl. infortunatum L. was confused with *Cl. adenophysum* Hall. f. by Bakhuizen van den Brink. The specimens from Sumatra and Borneo quoted by him in Rev. 91 under *Cl. infortunatum* all belong to *Cl. adenophysum.*

A fourth related species, which was also confused with *Cl. infortunatum* or with *Cl. viscosum*, and consequently remained unnoticed for a long time is:

Clerodendrum confusum Hall., f. Ergebn. 65; Lam, Verb. 290; Bakh. in Rev. Addit. II—III, excl. syn. *Cl. adenophysum* Hall. f.

The following key may be helpful to distinguish these four species:

1a. Corolla glabrous outside, calyx slit down to 1/4 of its length, leaves bullate at base in the axils of the palmately ascending nerves and bearing scale-like glands in the hollows; *Sumatra, Borneo* . . . . . **Cl. adenophysum** Hall. f.
b. Corolla manifestly hairy outside, calyx slit down for more than 1/3 of its length, leaves not bullate 2
2a. Corolla tube about as long as calyx, calyx slit down for about 1/3—1/2 of its length, innovations greyish-pubescent; *Sumatra, Java, Karimon Djawa* . . . . **Cl. confusum** Hall. f,
b. Corolla tube distinctly longer than calyx, calyx slit down for more than 1/2 of its length, innovations ochraceous- or ferruginous-pubescent 3
3a. Pubescence of corolla ferruginous, calyx lobes with prominent midrib, leaves on lower surface with minute glands and with a number of larger glands near the base and near the midrib; *Ceylon* . . . . . . **Cl. infortunatum** L.
b. Pubescence of corolla whitish, calyx lobes without prominent midrib, leaves often with minute glands on lower side, but never with larger glands near base or midrib; *India and South China to Sumatra and Java* . . . . **Cl. Petasites** (Lour.) A. Meeuse

Clerodendrum japonicum (Thunb.) Sweet, Hort. Brit. 1826, 322; P'Ei, Verb. China 141 — *Volkameria japonica* Thunb., Fl. Jap. 1784, 255 — *Clerodendron squamatum* Vahl, Symb. 2, 1794, 74; Hall. f., Ergebn. 81; Lam, Verb. 302; Dop in F. G. I. C. 862 — *Clerodendron japonicum* Makino in Bot. Mag. Tokyo 17, 1903, 91 — *Clerodendron coccineum* H. J. Lam, Verb. 296 — *Clerodendron squamatum* var. *typica* Bakh., in Rev. 93.

Congea Roxb.

Congea velutina Wight, Icon. 1850, t. 1497, 3 or 1566 (*sic!*); C. B. Clarke in Hook. f., Fl. Br. Ind. 4, 1885, 603; Bakh. in Rev. 101; Dop in F. G. I. C. 908 — *Congea Forbesii* King & Gamble in Kew Bull. 1908, 114; Lam, Verb. 337 — *Congea tomentosa* (haud Roxb.) Hall. f., Ergebn. 86; Lam, Verb. 338.

As far as we can see from the scanty material in the Leyden Herbarium, the plants cultivated in Java all belong to the form of *C. velutina* with four-leafed involucre. It is not clear whether Ridley in F. M. P. 640 (in nota) meant this species or the true *C. tomentosa* Roxb.; at any rate Hallier no. 247 (in H. L.-B.), collected at Singapore, where it was cultivated, belongs to *C. velutina.*

Avicennia L.

Avicennia alba Bl., Bijdr. 1826, 821; Hall. f., Ergebn. 87; Ridley, F. M. P. 641; Fletcher, Siam. Verb. 443; Moldenke in Herb. Lugd.-Bat. and in "The geographic distribution of the Avicenniaceae and certain genera of the Verbenaceae" (stencilled, issued Sept. 20, 1939) — *Avicennia marina* (Forsk.) Vierh., var. *alba* (Bl.) Bakh. in Rev. 207 and in Bull. Jard. Bot. Buitenz. Sér. III, 3, 1921, 207; Merrill, Enum. 407; Dop in F. G. I. C. 894.

This species differs, in my opinion, from the typical *A. marina* in so many respects, that a separation seems justified, which view is also held by Moldenke, who is preparing a monograph of the genus.

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ON THE TAXONOMIC POSITION OF EUCOMMIA ULMOIDES OLIV. (EUCOMMIACEAE)

by

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(Leiden).

1. Introduction.

During an anatomical examination of *Eucommia ulmoides* Oliv., performed at the request of Dr L. G. M. Baas Becking, on behalf of the Technical Division of the Central Committee for Applied Science, a survey of the literature showed that many divergencies of opinion exist as to the relationship of the monotypical natural order of the *Eucommiaceae* with other families. The anatomical evidence obtained, might, together with morphological characters, shed more light on this relationship.

The writer is greatly indebted to Dr H. J. Lam, professor of Systematic Botany and Director of the National Herbarium (Rijksherbarium), to Dr L. G. M. Baas Becking, professor of General Botany, and to Dr S. J. van Ooststroom, of the Rijksherbarium, all at Leiden, for various ways of assistance in this work as well as to Dr J. Jeswiet, professor of Systematic Botany and Director of the Arboretum of the Agricultural College at Wageningen, for kindly providing us with flowering and dried material.

Eucommia ulmoides, the sole species of the sole genus of the family, is a native of China, where it is found in the provincies of Hupeh, Szechuan, Anhwei and Chekiang. According to the first collector, Henry, the plant is occasionally cultivated in the districts of Chang-Yang and Patung of the province of Hupeh, chiefly because of the alleged medicinal value of the bark. Probably the plant grows wild in the Northern district of Fang. Farges mentions the plant as cultivated in East Szechuan in the district of Tchen-Ke'ou-Tin. Localities in the provinces of Anhwei and Chekiang are given by Hsen-Hsu Hu and Woon-Yung Chun (11). Parkin (18) states that the plant was first introduced in Europe (France) in about 1890. From France the plants arrived at Kew in 1897 and were further distributed from there.

2. Taxonomic position.

The taxonomic position of *Eucommia* has, since its first description, undergone many changes. The original material lacked flowers and its description by Oliver (15) did not lead to a definite placing of the genus, both the *Ulmaceae* and the *Euphorbiaceae* being suggested as related. The latter family was again mentioned by Weiss (32), the former by Harms (8).

In 1895, Oliver gives the first description of both the male and the female flowers. The *Ulmaceae* are not mentioned as a related family, but under the influence of a written communication by Baillon who claimed the identity with *Euptelea Davidiana* Baillon, Oliver classed *Eucommia* under the *Trochodendraceae* (sensu Prantl). Oliver, however, did not recognize the alleged identity of the two genera mentioned, since *Euptelea* lacked latex and since its flower structure essentially differed from that of *Eucommia*. Yet, he considered both genera sufficiently related to insert them in the same family.

The *Trochodendraceae* (sensu Prantl), as segregated from the *Magnoliaceae,* now contained the genera *Trochodendron, Tetracentron, Euptelea, Eucommia* and *Cercidiphyllum.* According to Oliver (16) the first two genera, characterized by their more or less connate carpels and not apiculate anthers, could be combined so as to form a section. The other three genera then should form another section characterized by "free carpels and elongate and apiculate anthers". This classification, however, is in contradiction with Oliver's own words. In his description of 1891 he states "pistillum dimerum syncarpicum" and in 1895: "solitary ovary with bifid stigma, presenting every appearance of a syncarpous dicarpellary pistil". The reasons for Oliver's classification remain, therefore, a mystery.

In his description of the fruit, Oliver in 1891 mentions the words "in the cell of the fruit, which survives and includes the solitary seed", by which it is suggested that one of the carpels is abortive. This indeed appeared to be true.

Harms (7) proposed the segregation of *Tetracentron* from the *Trochodendraceae.* For the remaining four genera he followed Oliver's erroneous classification, in which *Eucommia* was placed in the *Eupteleoideae,* the carpels of which were regarded to be free. *Eucommia* should possess a gynoeceum which is bifid at the top.

The error was first discovered by Solereder (28) who re-investigated the gynoeceum and showed it to consist of two connate carpels, one of which is abortive. The reason for Solereder's investigation was probably the supposed relationship of *Euptelea, Eucommia* and *Cercidiphyllum* with the *Hamamelidaceae* (cf. Oliver 16) as claimed by Baillon. Accordingly, Solereder transferred *Cercidiphyllum* and *Eucommia* to the *Hamamelidaceae.*

Van Tieghem (29) could not entirely agree with Solereder's point of view. Not only *Eucommia* and *Cercidiphyllum* but also *Euptelea* should be segregated from the *Trochodendraceae.* The three genera should belong to three separate families, having little in common.

In the recent handbooks mainly two opinions exist as to the relationship of the *Eucommiaceae.*

1. The *Hamamelidaceae* are still considered the closest ally, as is in accordance with the views of Baillon and Solereder, to whom may be

added the names of Schneider (26), Wettstein (33a), Hutchinson (12), Engler (3 and 4), Engler-Diels (5) and Komarow (13).

2. Oliver's original suggestion, according to which the *Ulmaceae* should be the nearest of kin, was supported by Harms (8), although he did not mention the source of this opinion. Wettstein (33b), referring to Harms (8) and finally also Pulle (23) agree with this conclusion. Additionally, a paper by Tippo (30) on the comparative anatomy of the secundary xylem and the phylogeny of the *Eucommiaceae* may be mentioned, although this was unaccessable under the present circumstances.

3. SURVEY OF CHARACTERS.

In order to re-examine the relationship of the *Eucommiaceae*, morphological and anatomical characters of the family were again compared with those of supposedly related families. Part of these characters are taken from the literature, part of them are founded on my own observations. A survey of these characters is given in the accompanying table. By means of the keys in Engler-Prantl's "Natürliche Pflanzenfamilien", genera were looked for, which showed the closest relation with *Eucommia*. As far as possible, dried material of these genera was examined. Concerning the classification of the orders, Von Wettstein's "Handbuch der Systematischen Botanik" (33b) was followed.

4. EXPLANATION OF CERTAIN CHARACTERS OF THE EUCOMMIACEAE MENTIONED IN THE TABLE.

The phyllotaxis is mentioned by Oliver (15) as distichous. We find the same opinion in the monograph by Harms (8) and in various handbooks. The accompanying figure (*Fig. 1*), representing a cross-section through a terminal bud a little above the level of the vegetation point, shows, however, that the phyllotaxis is originally rather alternate, viz. $^2/_5$ with an inclination towards $^3/_8$. On full-grown lateral shoots, the leaves often seem to be distichous. Close inspection of the position of the axillary buds, however, shows that these buds are actually arranged in a spiral so that this is a case of plagiotropic shoots rather than of a truly distichous phyllotaxis.

Harms gives for the length of the leaves 6—8 cm. This is only true for the small fertile shoots. For full-grown leaves Oliver mentions 15—17.5 cm. In sterile branches I observed leaves as long as 19.5—25 cm.

The male inflorescence is most probably a cyme. However, this can only be conclusively stated by an ontegenetic study.

The getah-percha containing latex elements of *Eucommia* are treated in another paper (lit. 31). It may suffice to mention here that they are unbranched and that they start as unicellular tubes below the stem vegetation point. They originate in about the same way as mentioned by Zander (34) for latex elements of other plants, although they are differing from these in many respects.

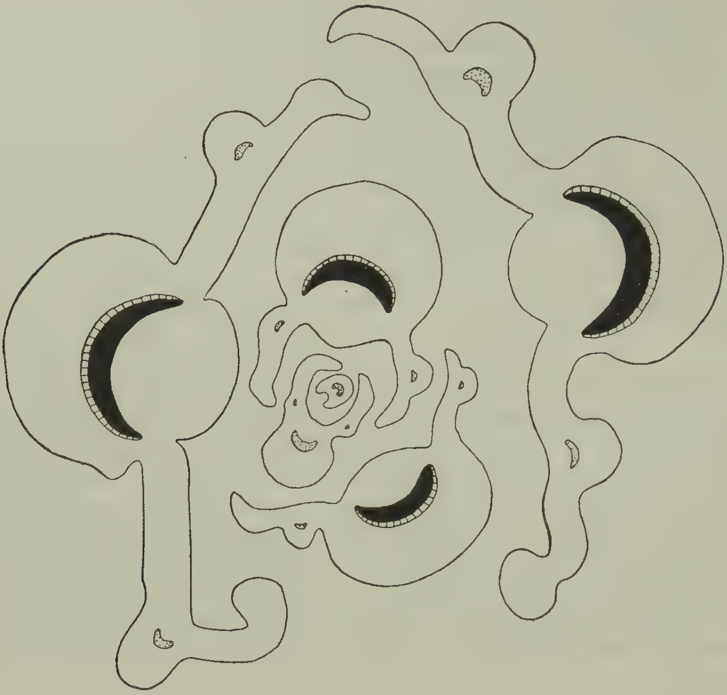

Fig. 1 — Cross section of a terminal bud of *Eucommia ulmoides* Oliv.; black, xylem; dotted, procambium bundles; hatched, phloem; white, parenchyma.

5. Relation with the Ulmaceae.

The possibility of this relation has been brought forward by Oliver in 1891. This author states that "The fruit and the general aspect of the specimens at once suggest Ulmaceae". Harms (8) mentions these arguments anew and draws the attention to the similarity of the leaf venation. From the table appear, moreover, several other characters *Eucommia* has in common with the *Ulmaceae*, such as: flowers in axillary cymes or the female flowers solitary in the leaf axils; flowers mostly unisexual; the syncarpous gynoeceum consists of two carpels, only one cell of which being developed, the other being usually abortive; the stigmata papillate on the inner surface; shrubs or trees from the tropics of subtropics also occurring in China, with simple, often asymmetrical and serrate leaves; leaf epidermis often with cuticulary folds and the stomata sometimes with auxiliary cells; collenchyma often occurs in the bark, suberization subepidermal e. g. in *Ulmus*, epidermal in *Eucommia*; secondary phloem often interspersed by sclerenchyma bands.

Important anatomical characters are further the presence of nearly exclusively simple vascular perforations, of libriform with bordered pits and of unicellular conical hairs, the wall of which may be either calcified or silificied in toto or may possess calcified thickenings.

On the other hand, there are important objections to combine

Eucommia with the *Ulmaceae*. Oliver has already mentioned that *Eucommia* shows no trace of a perianth even in the very young stages in the winter buds. The leaves possess no stipules. The *Ulmaceae* have only one ovule in the sole cell, while *Eucommia* possesses a collateral or nearly lateral pendulous abortive second ovule.

To this we may add the following differing characters. In *Ulmus* the leaves are claimed in literature to be distichous, as is already shown by the first set of leaves developing after the cotyledons (Lubbock, 14); however, the topmost leaves of the flowering branches are often placed in a spiral; the styles are linear and albumen is mostly absent; the *Ulmaceae* do not show latex; cells containing mucilage occur in the leaf and in the bark of e. g. *Ulmus fulva* Michx., the "Slippery Elm" of Canada. Priemer (22) studied the ontogeny of these cells and showed their cystolith nature in the foliar epidermis. In the mesophyl and in the bark they are apparent by their size but they are never tubiform. Neither in their contents, nor in their ontogeny, these cells, therefore, show much relation to latex elements.

Particularly the following genera were compared with *Eucommia*: of the *Ulmoideae, Ulmus* and *Holoptelea* and of the *Celtoideae, Celtis, Pteroceltis, Zelkowa* and *Aphananthe*.

Of these genera, *Ulmus* is undoubtedly the closest relative, as appears from the characters mentioned above. Moreover, the embryo is straight and the cotyledons are flat. On the other hand, *Ulmus* is characterized by bisexual flowers, possessing a perianth, while *Eucommia* has unisexual flowers without a perianth. Of the dried material examined, it appeared that *Ulmus parvifolia* Jacq. shows the closest resemblance. The specimen available was hailing from Sikkim, but according to the literature this species is also found in China and Japan. Our common *Ulmus campestris* L. was also compared, but of this the fruit is distinctly smaller.

Holoptelea is more different from *Eucommia* by its entire leaves, the cotyledons are longitudinally folded and the area is India and Ceylon. This genus has, like *Ulmus,* mostly bisexual flowers, but unisexual ones are also known. The fruit, however, shows a strong resemblance with that of *Eucommia. Aphananthe* agrees with *Eucommia* in its unisexual flowers, the male ones arranged in cymes, the females solitary. The seed is provided with a thin layer of endosperm and the cotyledons are narrow. The leaves are pennately nerved and serrate. Triplinerve leaves, however, are occurring likewise and so are stipules which are lacking in *Eucommia.* The fruit possesses two sessile stigmata but for the rest it is different in that it is not winged and in that its pericarp is fleshy. In addition, the cotyledons are rolled up. Some slight general similarity with *Eucommia* was found in dried material of *Aphananthe aspera* (Thunb.) Engler from China (Kwantung).

With *Zelkowa,* a genus represented in southern China, *Eucommia* has the unisexual flowers in common, as well as the serrate pinnately nerved leaves which are, however, not acuminate in *Zelkowa.* On the other hand, *Zelkowa* possesses a perianth. The fruit is drupaceous and has a short excentric style. Endosperm is wanting and the cotyledons are broad and lobed. Finally, stipules are found in this genus.

In *Pteroceltis* and *Celtis* triplinerve leaves are still more common than in *Aphananthe.* They are, moreover, characterized by thorns. Both genera have the flowers either unisexual or bisexual; a perianth is extant and the cotyledons are broad. As to the fruit, *Celtis* has an unwinged drupe; in *Pteroceltis* the fruit is winged and, according to the literature, it is recalling that of *Ulmus.* No material of the last-named genus, however, was available for examination.

6. RELATION WITH THE MORACEAE.

Eucommia agrees with the *Moraceae* in the following points. In the last-named family the flowers are often dioecious, and in unisexual flowers which are often arranged in cymose inflorescences, the perianth is sometimes lacking. The pistil consists of two connate carpels both or one of which may be developed. The ovary is usually 1-celled, more exceptionally 2-celled. The stigmata are papillate. Albumen may be extant or wanting. The *Moraceae* comprise trees or shrubs with usually simple leaves, also occurring in tropical and subtropical Asia.

Collenchyma is found in the cortex; the secondary phloem contains sclerenchyma. In *Morus* the xylem vessels have spirally thickened walls and a simple vascular perforation. The wood rays are sometimes uni- or biseriate. In addition, latex elements are often found as well as unicellular hairs, calciumcarbonate and silica.

On the other hand, the ovary cells contain only one ovule, the styles are usually developed and the fruit is not winged.

The phyllotaxis is claimed in literature to be distichous or decussate and stipules are always extant. Auxiliary cells are wanting in the stomata and the latex elements show a different way of originating as well as a different anatomy.

On account of the similar characters the genera *Taxotrophis* and *Streblus* were compared. Both are distinguished by dioecy; the ♀ flowers are often solitary, the ♂, however, are, in contradistinction to *Eucommia,* arranged in spikes or racemes.

Taxotrophis has an ovary with a bifid style which is originally apical but ultimately becomes lateral. The plants are trees and shrubs with serrate leaves. Differences from *Eucommia,* however, are that there is a perianth, that the cotyledons are broad and rolled up, that the fruit is not winged, and that there are axillary thorns as well as stipules.

Streblus is found in Malaysia and southern China. In this genus the perianth is surrounding the ovary. The cotyledons are unequal, one of them being large and bilobed, the other small.

Dried material of both genera shows a slight resemblance with *Eucommia.*

7. RELATION WITH THE CANNABACEAE AND THE URTICACEAE.

Eucommia is agreeing with the *Cannabaceae* regarding the ovary in unisexual flowers of dioecious species, as well as regarding the anatomical characters mentioned under the *Ulmaceae* and the *Moraceae.* In *Cannabis* the phyllotaxis is originally spiral.

Points of difference are the perianth, the single ovule, the capsule, the palmately nerved leaves and the stipules.

In the *Urticeae* the stigmata are sometimes sessile and papillate. In some cases the leaves are spirally arranged. The single basal and atropic ovule, however, leads to the conclusion that in the *Urticales* the *Urticaceae* are undoubtedly the least related family in comparison with *Eucommia.* It is difficult to mention a genus which shows some direct relation with *Eucommia.* Perhaps those species of *Memorialis* from Malaysia may be quoted here which show a winged fruit but they are, for the rest, much different.

On the other hand, it may be stated that there are only few families in which the latex elements are so much resembling those of *Eucommia* as is the case in the *Urticaceae* and the *Cannabaceae.* In the two last-named groups unicellular and unbranched tubes are formed just below the vegetation point. This way of originating was first described for *Eucommia* by Weiss (32) and is, for the rest, only known in *Cannabis* and *Humulus* (Zander l. c.) and in *Urtica* and further in *Vinca* (Schaffstein 24). Yet, in *Eucommia* there is a point of distinction in that additional tubes are formed by the cambium and that they are also found in the roots.

8. Relation with the Euphorbiaceae.

With this family *Eucommia* has only little in common. It is true that in the table several characters have been printed in heavy type but these can as a rule not be said to be essential for the whole family, since most of them are occasional phenomena. The following characters may be considered evidential: plants dioecious, perianth sometimes none, two apical anatropic ovules in the cell, albumen extant, leaves alternate and mostly simple, stomata often with auxiliary cells, cortex with collenchyma, phloem sometimes provided with sclerenchyma bands, xylem vessels with always simple and sometimes moreover with scalariform perforations. Latex elements are found in many *Euphorbiaceae.* However, they are either multicellular vessels or unicellular tubes. In the last-named case they originate in a definite number in the embryo (Chauveaud 1, Schaffstein l. c.) and they are branched. In these respects the latex elements of *Eucommia,* therefore, show no relation with those of the *Euphorbiaceae.*

Weiss (l. c.) makes the remark that if *Eucommia,* as is the opinion of Oliver (1891), should be related to the *Euphorbiaceae,* it would have to be placed in the *Crotonoideae,* since latex elements are wanting in the *Phyllanthoideae.* More exactly, its place would be near the *Johannesieae* or, if we should lay as much stress on the structure of the latex elements as is done by Pax (19), between the *Johannesieae* and the *Hippomaneae.* According to Chauveaud's classification of latex elements (c. f. Weiss, l. c. page 253), however, we might associate *Eucommia* with either *Cannabis, Urtica* or *Vinca.* It must be stated, however, that Weiss himself considers these suggestions very doubtful on account of the fact that the structure of the flower of *Eucommia* was not yet known.

From the way of originating and the anatomical structure of the latex elements in *Eucommia* it is obvious that a relationship with the

Johannesieae and the *Hippomaneae* in this respect can hardly be considered.

On comparing the morphological characters of the two groups mentioned with those of *Eucommia* we meet with the following resemblances and differences. *Johannesia, Annesijoa* and *Hevea* are distinguished by compound leaves with entire leaflets. They are monoecious, a calyx and a corolla are found in the two first-named genera; in *Hevea* only a calyx is extant. In all three genera the filaments are connate. The ovary is 3-celled in *Annesijoa* and *Hevea*, 2-celled in *Johannesia.* It appears from this enumeration of characters that the *Johannesieae* are very much different from *Eucommia.*

The *Hippomaneae* show some more resemblance in their general characters (c. f. Pax, 20). The following points are supporting the relationship: woody plants, rarely undershrubs, leaves mostly alternate, provided with glands at the teeth, unicellular latex tubes, stomata with two auxiliary cells lying parallel to the aperture, unicellular hairs rarely extant, vessel perforation simple, perianth always apetalous, entirely wanting in *Adenopeltis* (this is the only essential point of resemblance between *Adenopeltis* and *Eucommia*).

The following points are those in which *Eucommia* is differing from the *Hippomaneae*: The latter group has a different leaf shape, small caducous stipules and extrafloral nectaries. They are monoecious and possess terminal inflorescences, stamens mostly 3—2, pistil with 3—2 carpels, fruit a dehiscent capsule of which the central axis is remaining, latex tubes unicellular and branched.

Reduction of the ovary to one cell with 3—2 short bifid styles is found in the *Crotoneae,* to wit in the American genera *Crotonopsis* and *Eremocarpus.* In *Crotonopsis* the petals are wanting in the female flowers and the small capsule is not dehiscent. These are annual herbs with distichous or decussate leaves. Further unicellular hairs with a scale-like dilatation at the base are occurring here. Others tribes or genera in the *Crotonoideae* with eventual resemblances with *Eucommia* could not be traced.

The *Phyllanthoideae* have, like *Eucommia,* two apical anatropic ovules in the cell. They are, however, differing by the lacking of latex as well as by most of their morphological characters. A 1-celled ovary is found in the dioecious genera *Antidesma, Cometia* and *Drypetes.* They never show any trace of abortive cells.

It is true that *Hymenocardia* possesses a winged fruit which more or less reminds us of that of *Ulmus* and *Eucommia* but this fruit is a 2-celled dehiscent capsule with a permanent central axis.

9. Relation with the Hamamelidaceae.

Solereder in 1899 inserted *Eucommia* in the *Hamamelidaceae* on account of the following characters: flowers unisexual without a perianth, connectives apiculate, two connate carpels with apical anatropic ovules and fairly well developed stigmata, embryo large. Certain anatomical characters were given in support to this opinion: scalariform vessel perforations, libriform with bordered pits and narrow uniseriate wood rays.

To these points we may add that in the *Hamamelidaceae* the fruit is mostly 1-seeded and that the seed is containing endosperm. In this family there is a great number of trees and shrubs occurring in central and southern China. The cortex often contains a collenchyma tissue and the stomata possess auxiliary cells.

In spite of these similarities, *Eucommia* would hold a rather isolated position in the *Hamamelidaceae*, as was already remarked by Solereder, on account of the solitary ♀ flowers and the entirely different fruit. We may add the following points of difference. Dioecy is very rare in the *Hamamelidaceae* and the perianth is only wanting in a very few genera. It is true that the pistil consists of 2 carpels but the condition that one of these is regularly aborted is not known.

Regarding the anatomical characters the following differences may be enumerated. In the *Hamamelidaceae* latex elements are unknown. Solereder considers this character unimportant although, in my opinion, it is essential and constant in many families. Furthermore, *Eucommia* possesses scalariform vessel perforations only in the primary xylem. The secondary xylem exclusively shows simple perforations. The latter are, therefore, not exceptional, as was claimed by Solereder.

It appeared from the keys to the genera of the *Hamamelidaceae* given by Harms in Engler & Prantl, that the following genera might show some relation with *Eucommia*: *Distylium, Altingia, Sinowilsonia, Parrotia, Eustigma* and *Fortunearia.* Of these *Distylium* is probably the nearest of kin by the unisexual flowers, the lacking of the petals, the eventual abortion of the calyx, the oblong anthers with elongated connective and the 2-celled ovary with subulate stigmata. The embryo is almost as long as the albumen, the flat cotyledons almost twice as long as the straight radicle. The leaves are often serrate towards the apex. In addition, one species of *Distylium* is found in China (Hupeh), viz. *Distylium chinense* Diehl.

Yet, on considering the following characters, the resemblances prove to be very superficial. The plants are monoecious, the flowers of both sexes being arranged in short axillary spikes or racemes, mostly with a bisexual terminal flower. There is one ovule in each cell of the ovary and there are two subulate styles. The fruit is a tomentose bivalvate capsule, the valves being bifid. There are stipules which are caducous. Latex elements are wanting and stellate hairs are found on the innovations.

Altingia has likewise apetalous unisexual flowers while the calyx is also wanting in the male flowers. Exceptionally, female flowers (with a 2-celled ovary) are found solitary in the axils of the uppermost leaves. As in *Eucommia* the albumen is scanty and the cotyledons are flat and oblong.

However, the inflorescences are very much different. The ♂ flowers are combined into terminal thyrses with sometimes 1—3 female flowers at the base. For the rest, the female flowers are forming globular capitula; their calyces bear on the rim small connate scales which ultimately indurate. The flower is perigynous, the ovules are numerous and are inserted in 4 rows at the septum. As in *Distylium* the fruit is a bivalvate capsule with bifid valves.

From a comparison of dried material of *Altingia chinensis* Champ. from Kwantung and of *A. excelsa* Nor. from Assam and western Malaysia it appeared that the Chinese species showed the least resemblance with *Eucommia.* The latter has, namely, obovate serrate leaves. On the other hand, the ovate and serrate leaves of *A. excelsa* strongly recall those of *Eucommia.* Finally, *A. gracilipes* Hemsl. from southern China may be mentioned which, according to the description, is distinguished from the other species by the small serrate leaves. Material of this species was not available for examination.

Sinowilsonia from China, which in many respects resembles *Distylium,* is distinctly less related to *Eucommia* than *Distylium. Parrotia* from northern Persia has still fewer characters in common with it. The flowers are apetalous but bisexual. The anthers are apiculate, the ovary is 2-celled. The leaves are often unequal at the base and coarsely serrate towards the apex. *Eustigma* and *Fortunearia* from China need no further consideration. Of the former only the subulate and densely papillate stigmata resemble those of *Eucommia.*

10. RELATION WITH THE TROCHODENDRACEAE (SENSU V. TIEGHEM).

Even a superficial glance at the table shows that *Eucommia* has but very few characters in common with *Trochodendron,* the sole genus of the family. The principal points of resemblance are the wanting of the perianth, the apical anatropic ovules, the albumen and the simple leaves without stipules.

Points of difference are the entirely different inflorescences, flower parts, fruits, phyllotaxis and leaf shape. The leaves of *Trochodendron* are characterized by very long petioles. In addition, *Eucommia* is differing in a great number of anatomical characters enumerated by Van Tieghem (l. c.). Among these the lacking of vessels in the xylem and of latex elements in *Trochodendron* seem to be the most striking. In my opinion, Solereder en Van Tieghem were therefore right to exclude *Eucommia* from the *Trochodendraceae.* In recent publications this relationship has no longer been mentioned.

11. SUMMARY (cf. the Table).

Summarizing, it appears that *Eucommia* has the greatest number of characters in common with the *Urticales.* This is shown by the similarity of the inflorescences as well as by the unisexual flowers and the dioecy. In both groups the pistil consists of 2 connate carpels and the ovary is usually 1-celled by abortion, while the stigmata are generally papillate.

Further general points of relation with the *Urticales* are the originally spiral phyllotaxis, which becomes later on pseudo-distichous, simple vessel perforations, libriform with bordered pits, unicellular hairs and the occurrence of calciumcarbonate and silica as well as of latex elements.

Yet, it seems difficult to indicate any particular family in the

Urticales to which *Eucommia* should be most related. While the fruit recalls *Ulmus* and the latex elements *Urtica* and *Cannabis*, the spirally thickened vessel walls remind us of some *Morus* species. In addition, *Eucommia* is isolated by the facts that in the *Urticales* the perianth is never entirely wanting, that there is only one ovule in the cell of the ovary, that stipules are very frequent, that calciumoxalate is characteristic (it is wanting in *Eucommia*) and that the superficial suberization is subepidermal in the *Urticales* and epidermal in *Eucommia*.

After the *Urticales* the *Euphorbiaceae-Hippomaneae* seem to be the nearest of kin, on account of a number of anatomical and morphological characters. However, the *Euphorbiaceae* usually possess a 3-celled ovary, a 2-celled one occasionally occurs in the *Hippomaneae*. Next follow the *Hamamelidaceae* which have, however, two fertile carpels but of which *Distylium* and *Altingia* show a reduction in the perianth and the latter moreover a similar leaf shape.

12. CONCLUSIONS.

1. *Eucommia ulmoides* Oliv. is strongly isolated in the system.
2. The view of Van Tieghem (1900) to accept a separate family for this species seems justified.
3. It is suggested to insert this family in the order of the *Urticales*.
4. The *Ulmaceae* and among these *Ulmus* are considered the nearest of kin of *Eucommia*.
5. There is some slight relation with the *Euphorbiaceae-Hippomaneae* and still less with the *Hamamelidaceae* in which *Eucommia* was inserted by Solereder in 1899.
6. There is no relation whatsoever with the *Trochodendraceae* (sensu van Tieghem).

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CONSPECTUS OF THE CHARACTERS OF THE EUCOMMIACEAE AND SOME OTHER FAMILIES

THOSE CHARACTERS IN WHICH THE VARIOUS FAMILIES AGREE WITH EUCOMMIA ARE PRINTED IN HEAVY TYPE

CHARACTERS	MONOCHLAMYDEAE							DIALYPETALEAE
	URTICALES					TRICOCCAE	HAMAMELIDALES	POLYCARPICAE
	EUCOMMIACEAE	ULMACEAE	MORACEAE	CANNABACEAE	URTICACEAE	[illegible]	HAMAMELIDACEAE	TROCHODENDRACEAE (sensu Van Tieghem)
Habit	**Shrubs or trees**	**Shrubs or trees**	**Shrubs or trees**, seldom herbs	Herbaceous	Mostly herbs, **seldom shrubs or trees**	**Shrubs or trees**, seldom herbs	**Shrubs or trees**	**Shrubs or trees**
Distribution	**China**	Tropics and subtropics **(also China)**	Tropics and subtropics **(also China)**	Tropics and subtropics **(also China**	Mostly tropics: N. America, **Asia**, Malaya, Africa, Europe	Trop., subtrop. and temp. **(also China)**	Mostly **Central and S. China**, subtropical and extratropical Asia, N. America and S. Africa	S. Japan
Stem Cortex	**Homogeneous, collenchyma present**	**Collenchyma present** (e. g. *Ulmus*), *Celtis* shows sclereids, outer layer silicified	**Collenchyma present,** often sclereids or continuous sclerenchyma band	**Collenchyma present** (*Cannabis*)	**Collenchyma present**	**Collenchyma strongly developed in** *Hippomaneae*, *Croloneae* and *Euphorbieae*, later on sclereids	**Collenchyma** and sclereids **often present**	Cavities and branched sclereids present
Suberization	**Epidermal**	Subepidermal	Subepidermal	?	Subepidermal, in *Urtica* deeper in the cortex	**Epidermal** or subepidermal	Subepidermal	superficial
Pericycle	**Sclerenchyma in early stages absent, after 3 years present in an almost continuous uniform band**	Continuous band of **sclerenchyma** mixed with stone cells or isolated sclerenchyma bands	Long **sclerenchyma fibres** in isolated strands	Long **sclerenchyma fibres present** (*Cannabis*)	Long **sclerenchyma fibres** (to 22 cm) in isolated strands	Only primary **sclerenchyma fibres** present or continuous band of sclerenchyma mixed with stone cells	Mostly continuous band of **sclerenchyma** mixed with stone cells (except in *Liquidambar* and *Altingia*)	Continuous band of **sclerenchyma** mixed with [illegible]
Secondary phloem	**Interspersed with sclerenchyma bands**	**Interspersed with sclerenchyma bands**	**Interspersed with sclerenchyma bands**	**Interspersed with sclerenchyma bands**	**Interspersed with sclerenchyma fibres**	**Sclerenchyma present** or absent, sometimes sieve tubes absent (*Hippomaneae*)	**Sclerenchyma seldom present** (e. g *Distylium*)	Sclerenchyma absent
Secondary xylem	**Vessels present, isolated, uniformly distributed, tertiary spiral bands present, simple vascular perforation in secondary xylem, scalariform perforation in primary xylem**	**Vessels present almost exclusively simple vascular perforation** (except *Planera*	**Vessels present, walls spirally thickened** (*Morus*), lumen alternately wide and narrow, **simple vascular perforation**	**Vessels present, mostly isolated, simple vascular perforation**	**Isolated vessels present** (to 80 μ wide), **simple vascular perforation**	**Vessels present, simple vascular perforation** (*Hippomaneae* and *Joannesieae*) **or simple perforations combined with scalariform perforations**	**Isolated narrow vessels present,** scalariform vascular perforation	Vessels absent, tracheids with [illegible] form border[illegible]
	Libriform with bordered pits, xylem rays uni- or biseriate	**Libriform with bordered pits,** xylem rays multiseriate (3—7 cells wide)	**Libriform with bordered pits, xylem** rays to 7 cells wide, **sometimes 1—2 cells wide**	**Libriform with bordered pits, xylem rays uni- or biseriate** in *Cannabis*	Libriform with simple pits, **xylem rays** wide or **narrow**	**Libriform** with simple pits, **sometimes with bordered pits, xylem rays narrow**	**Libriform with bordered pits, xylem rays uni- or biseriate**	Primary xy[illegible] **secundary xylem rays uniseriat**[illegible]
Pith	**Homogeneous, in older stages a central cavity is present**	**Homogeneous**	**Homogeneous** (*Ficus*)	**Homogeneous, in mature internodes a central cavity is present**	**A central cavity present in** *Urtica*	**Homogeneous** or heterogeneous	**Homogeneous** (except in 2 *Liquidambar* species)	Heterog[illegible]
Leaf Phyllotaxis	**Spiral, 2/5—3/8, later on pseudo-distichous**	Distichous, topmost leaves of flowering branches **spiral**	± Distichous or almost decussate (originally spiral?)	Decussate or distichous, in *Cannabis* **originally spiral (2/5)**	Decussate, distichous or **spiral**	**Alternate** or decussate	Mostly distichous	[illegible]
Shape	**Simple, pinnate, asymmetrical, serrate, teeth with glandular cells**	**Simple, pinnate, asymmetrical, serrate, teeth sometimes with secretory cells**	**Simple, pinnate** or palmate, entire or **serrate**	**Simple** or compound, **palmate, serrate, teeth with glandular cells**	**Simple, pinnate,** entire, **serrate** or dentate	**Mostly simple** or compound, **sometimes teeth with glandular cells** (*Hippomaneae*)	**Simple**	**Simple, serrate**
Stipules	**Absent**	Present	Present	Present	Present	Present	Mostly present	**Absent**
Stomata	**Auxiliary cells present, cuticular folds**	**Sometimes auxiliary cells, cuticular folds.**	Auxiliary cells absent	Auxiliary cells absent	**Often auxiliary cells**	**Auxiliary cells present** or absent, **cuticular folds**	**Auxiliary cells 4 or 2**	[illegible]
Petiole	**1 leaf trace**	**Mostly 1 leaf trace,** sometimes 3 (*Gironniera*)	?	3 leaf traces in *Cannabis*, 7 leaf trace fuse into one in *Humulus*	Isolated leaf traces	?	Sometimes 3 leaf traces (*Liquidambar*)	3 leaf traces
Inflorescence	**♂ in small axillary fascicles, ♀ solitary**	Axillary pseudo-corymbs or ♀ **solitary**	**Cymose,** capitulate or cup-like pseudo-umbels	**Cymose,** panicles, capitula or ament	Pseudo-corymbs, pseudo-spikes or pseudo-capitula, **seldom solitary**	Spikes, panicles, **axillary fascicles** or cyathia	Spikes, racemes or capitula	Pseudo-racemes
Flower Sex	**Unisexual, dioecious, flowers show no trace of the other sex**	**Mostly unisexual,** often rudiments of the other sex, seldom bisexual (*Ulmus*) or polygamous	**Unisexual, dioecious** or monoecious	**Unisexual, dioecious**	**Mostly unisexual, dioecious or monoecious,** pistil rudiment in ♂ flowers, seldom bisexual	**Unisexual, dioecious** or monoecious	Bisexual, polygamous or **unisexual,** monoecious, **seldom dioecious**	Bisexua[illegible]
Perianth (parts of)	**Absent**	(8—7—6—)5—4(—3), theoretically in two whorls	(6—)4(—2), **sometimes absent**	5	5—4(—3—2)	**Absent,** simple or double	5—4, **seldom absent**	**Absent**
Stamens	**(10—)8(—6), free, anthers elongate and apiculate**	(8—7—6—)5—4(—3), connective indistinct	(6—)4(—2)	5	5—4(—3—2), epitepalous	∞ (300)—1, in *Hippomaneae* mostly 3—2	2 whorls of 5—4 stamens, inner one often staminodial, **connectives apiculate**	∞, in the lower part of the spiral the filaments are connate, connectives not apiculate
Pistil Carpels	**2 connate**	**2 connate**	**2 connate**	**2 connate**	**2 connate**	Mostly 3, **connate**	**2 connate** (seldom 3)	[illegible]
Ovary	**1 cell developed, 1 cell abortive**	**1 cell developed, 1 cell abortive**	2 cells, both or only 1 developed	**1 cell developed, 1 cell abortive**	**1 cell developed, 1 cell abortive**	20-celled in *Hura*, mostly 3-celled, sometimes 4—2 celled, **seldom 1-celled**	2-celled	Many-celled
Ovules	**2 (1 sterile) in the developed cell, apical, anatropic, 2 integuments**	1, **apical, anatropic, 2 integuments**	1, **apical, anatropic,** seldom basal, **2 integuments**	1, **apical,** campylotropous, **2 integuments**	1, basal, atropic, **2 integuments**	2 or 1 in each cell, **apical, anatropic,** obturator present, **2 integuments**	∞ — 1, **apical, anatropic, 2 integuments**	∞, **apical, anatropic 2 integuments**
Styles	**Absent**	**Linear,** seldom 4—2-fid	2 or 1, linear, **seldom absent**	2, cylindrical or **absent**	1 or **absent**	Free or ± connate	2, long, free, narrow	(8—7—)6(—5), free
Stigmata	**2, free, papillate**	**2, free, papillate**	**2, papillate**	2, linear, **papillate**	Sessile or not sessile, **papillate**	Mostly 3, often **papillate**	**2, free,** punctiform	Each style with 1 stigma
Fruit Type	**Samara**	**Samara,** nut or drupe	Nut or drupaceous	Capsule or nut	Nut or drupe	Capsule, seldom berry or drupe	2-celled capsule	Capsule
Number of seeds	**1**	**1**	**1**	**1**	**1**	**2 or 1 in each cell**	**Mostly 1**	∞
Seed Embryo	**Large (length is that of endosperm), straight, cotyledons narrow, flat**	**Straight** or curved	Often curved	Curved	**Straight**	**Straight** or curved, **cotyledons** broad, **flat,** thin	**Straight,** radicle small, cotyledons foliaceous	Small
Endosperm	**Present, thin**	Absent, **seldom present**	**Present** or absent	**Present,** fleshy, containing oil	**Present,** mostly strongly developed, containing oil	**Present,** strongly developed, containing oil	**Present, thin**	**Present,** containing oil
Latex elements	**Unicellular unbranched tubes formed below the stem vegetation-point, additional tubes formed by the cambium, present troughout the plant also in the roots**	Absent, cells containing mucilage occur in the leaf and in the bark, but they are not tubiform	**Present, unicellular tubes,** originate in a definite number in the embryo, branches push into other parts of the plant (e. g. into the secondary phloem), resin ducts and mucilage containing cells present	**Present, unicellular unbranched tubes originate below the stem vegetation-point,** tubes not formed by the cambium, absent in the roots	**Present, similar to those of the** *Cannabaceae*	**Present,** often multicellular (e. g. *Johannesieae*) or **unicellular** (e. g. *Hippomaneae*), in the last-named case the tubes originate in a definite number in the embryo and are strongly branched, lysigenous mucilage canals and secretion of resin and oil present	Absent, resin ducts in *Altingia* and *Liquidambar*	Absent
Hairs	**Simple, unicellular, silicified, walls with thickenings**	**Simple, unicellular,** conical, **walls often silicified** or calcified or with calcified thickenings	**Simple, unicellular,** conical, **walls often silicified**	**Simple, unicellular,** often with cystoliths, **walls** calcified or **silicified,** sometimes only at the top	**Simple, unicellular, often silicified at the top**	Mostly stellate, fascicled or squamate, **sometimes unicellular** (e. g. *Hippomaneae*)	Multicellular, stellate or fascicled, **simple, unicellular** (in *Liquidambar*)	Absent
Calcium oxalate	**Absent**	Present	Present	Present	Present	Present	Present	Present
Calcium carbonate	**Present**	**Present** in cystoliths, heartwood and pith (in 2 genera)	**Present** in cystoliths	**Present** in cystoliths	**Present** in cystoliths and in the basis of the hair walls	Absent?	Absent?	Absent?
Silica	**Present**	**Present**	**Present**	**Present**	**Present**	**Sometimes present**	Absent?	Absent
Tannin	**Present**	**Present**	**Present** in idioblasts	**Present**	?	**Mostly present** (often in xylem rays)	**Present**	?

A FIRST CONTRIBUTION TO OUR KNOWLEDGE OF THE FLORA OF THE TALAUD ISLANDS AND MOROTAI

by

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(Rijksherbarium, Leiden).

(Issued June 15th, 1942)

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GENERAL PART

(H. J. LAM)

1. INTRODUCTION.

The Talaud Islands are forming part of the Malay Archipelago, being situated north of Celebes and the Moluccas, south of Mindanao and east of the Sangihe group, between 3°45′ and 5°35′ N. lat. and 126°32′ and 127°10′ E. long.

The main group consists of three larger islands, viz. Karakelong, Salebaboe and Kaboeroeang. The Nenoesa islands, a group formed by the small islands of Garete, Karaton, Merampi, Mengkopoe, Intata, Kakelotan and Maroh are situated northeast of the main group, including also

Miangas (Palmas), an islet about 65 miles north of Karakelong, near Mindanao.

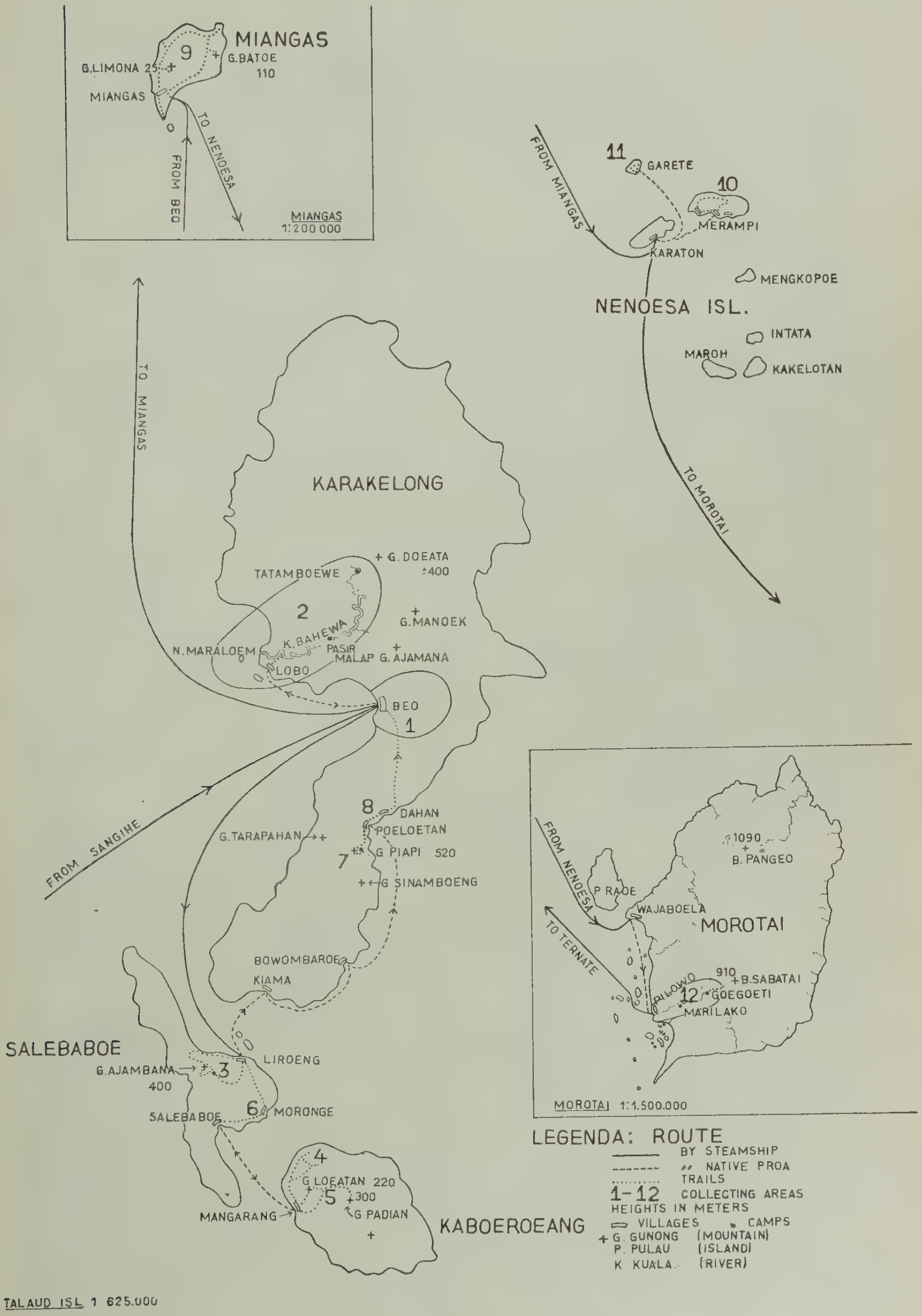
Morotai, belonging to the Moluccas, is situated north of Halmahera.

The botanical exploration of these islands, thusfar unexplored in this respect, had, in the early twenties, been suggested by Dr. E. D. Merrill, the well-known authority on Malaysian phytogeography. The then director of the Government Botanic Garden, Buitenzorg, Java, Dr. W. M. Docters van Leeuwen, appreciating this advice, organized a small exploration party under the guidance of the senior writer of the present paper, then botanist at the Buitenzorg Herbarium. On account of the limited time, this exploration, made from April 21st to July 1st, 1926, was of a preliminary nature. In my collecting work, I was assisted by two native attendants, Iboet, mantri at the Buitenzorg Herbarium, for the botany and Erih, mantri at the Zoological Museum, Buitenzorg, for the zoology. The map (*Fig. 1*) shows the route as well as the localities where collections were made. Their numbers correspond with those in the accompanying list, from which it may be seen, which numbers were collected in a given locality.

The purpose of this preliminary survey was to collect materials towards our knowledge of the phytogeography of these parts. It was, more particularly, desired to know whether and if so, to what degree there exists a phytogeographical relation between the Philippines on one hand and the Moluccas and New Guinea on the other. Recently, namely, several plants of apparently Papuan relationship had been detected in the Philippines (cf. Merrill, 1926) and it might therefore be expected that some of them would also occur in the interjacent islands, viz. the Talaud group and Morotai. It may be pointed out here that, some time later, a similar problem arose with reference to Central Celebes (Malili, etc.)

Fig. 1. — Map showing the route followed and the localities (cf. General Part, § 4).

Loc. 1 — Karakelong, vicinity of Beo: Nrs. 2475—2510, 2510a, 2511—2683, 3349, 3351—3352.
Loc. 2 — Karakelong, from Lobo along K. Bahewa (on the way Pasir Malap) and its tributary K. Tatamboewe to camp. Vicinity of camp: Nrs. 2684—2786, 2786a, 2787—2972; riverbanks K. Bahewa (Pasir Malap) and vicinity of Lobo: Nrs. 2973—3035, 3037; N. Maraloem: Nrs. 3036, 3038—3041.
Loc. 3 — Salebaboe, vicinity of Liroeng and G. Ajambana: Nrs. 3042—3172, 3348.
Loc. 4 — Kaboeroeang, groves of Lapean'a and Tonan'a forest reserves: Nr. 3173—3199.
Loc. 5 — Kaboeroeang, K. Ampas grove and trail to G. Padian (Pangangadoan'a and Boewid'oe wawi, tertiary secondary rocks): Nrs. 3200—3215.
Loc. 6 — Salebaboe, Moronge, Lota-swamp: Nrs. 3216—3232.
Loc. 7 — Karakelong, G. Piapi, east slope and top: Nrs. 3233—3339.
Loc. 8 — Karakelong, along trail Poeloetan — Dahang: Nrs. 3340—3347, 3350.
Loc. 9 — Miangas: Nrs. 3353—3367, 3367a, 3368—3395, 3395a, 3396—3415.
Loc. 10 — Nenoesa, Merampi: Nrs. 3416—3438.
Loc. 11 — Nenoesa, Garete: Nrs. 3439—3456.
Loc. 12 — Morotai, along K. Pilowo to Marilako and Goegoeti and on western slope of G. Sabatai above Goegoeti camp. Vicinity of Goegoeti: Nrs. 3457—3461, 3461a, 3462—3491, 3493—3600, 3600a, 3601—3628 (G. Ligòjer: Nrs. 3579—3603); riverbanks Goegoeti-Marilako-Pilowo: Nrs. 3492, 3629—3683.
Loc. 12a — Morotai, Wajaboela: Nr. 3684.


MIANGAS
9
G.LIMONA 25
G.BATOE
110
MIANGAS
0
FROM BEO
TO NENOESA
MIANGAS
1:200 000
FROM MIANGAS
11
GARETE
10
MERAMPI
KARATON
MENGKOPOE
NENOESA ISL.
INTATA
MAROH
KAKELOTAN
TO MOROTAI
TO MIANGAS
KARAKELONG
G. DOEATA
±400
TATAMBOEWE
2
G.MANOEK
K. BAHEWA
N.MARALOEM
PASIR
MALAP
G. AJAMANA
LOBO
BEO
1
8
DAHAN
POELOETAN
G.TARAPAHAN
7
G PIAPI 520
G SINAMBOENG
FROM SANGIHE
BOWOMBAROE
KIAMA
SALEBABOE
LIROENG
G.AJAMBANA
3
400
6
MORONGE
SALEBABOE
4
G LOEATAN 220
5
300
G PADIAN
MANGARANG
KABOEROEANG
TALAUD ISL 1 625.000
FROM NENOESA
1090
B. PANGEO
P RAOE
WAJABOELA
MOROTAI
TO TERNATE
910
B.SABATAI
PILOWO
12
GOEGOETI
MARILAKO
MOROTAI 1:1.500.000
LEGENDA: ROUTE
BY STEAMSHIP
" NATIVE PROA
TRAILS
1–12 COLLECTING AREAS
HEIGHTS IN METERS
VILLAGES
CAMPS
+ G. GUNONG (MOUNTAIN)
P. PULAU (ISLAND)
K KUALA (RIVER)

where the N. I. Forestry Survey carried out intensive local explorations, during which several representatives of the Papuan element were discovered (cf. Lam, 1938, 144—155), which were not yet known from the interjacent regions (N.E. Celebes or Banggai, Peleng, Soela, Boeroe, Ceram). It would, therefore, be worth while to have these islands more thoroughly explored in a near future.

2. GEOLOGY.

In contradistinction to the Sangihe Islands, which form a chain of purely volcanic islands of recent date, the Talaud Islands show no volcanic phenomena whatsoever. According to Roothaan, who made a first preliminary geological exploration of the group in 1921, and from whose publication most of the following data are taken, they seem to represent the remainder of a former connection between S.E. Mindanao and N. Halmahera. This opinion seems to be corroborated by the splendid work of the Snellius Expedition of 1929—1930. As is shown by the map (*Fig. 2*) taken from Van Riel's paper (Pl. II) the Talaud Islands, Miangas inclusive, are indeed in the north linked up with Mindanao by a submarine ridge. To the south "the Talaud ridge follows the centre of the Moluccan passage and joins up to the east arm of Celebes. A second arm of the latter ridge, the Snellius ridge, brings about a connection with Morotai and Halmahera" (Kuenen l. c. 187). It is true that these ridges lie 1300 and 2500 m below the present sea-level respectively, but anyhow their structure may mean that there is no indication of any direct connection either with the Sangihe ridge or with N.E. Celebes (although the Talaud ridge runs very close to the Minahasa coast) and that, as far as geological evidence is concerned, there may have been, on the whole, a better chance for the eastern flora element, both through Halmahera and Morotai and through the E. Celebes—Soela-ridge. In § 5 we will see, in how far this is corroborated by phytogeographical evidence.

The Talaud Islands consist of a basis of igneous rocks (diorite, gabbro and periodite), covered by relatively thin veneer of sediments. The igneous rocks are partly of Mesozoic, partly perhaps of Tertiary age. They reach the surface mainly in two coastal areas in North Karakelong, one in the extreme northwest, and a somewhat larger one in the northeast, and furthermore in the centre and at a part of the east coast of the narrower southern half of the island (G. Piapi!), in some very small portions of central Salebaboe and in a large part of the centre of Kaboeroeang. The small G. Batoe ridge on Miangas is probably likewise a denuded part of this geanticline.

Immediately covering these rocks are thin layers of siliceous schists of probably Mesosoic age. Apart from breccia of local importance probably originating from a period of regression of unknown age, these schists are covered by younger, probably Tertiary sediments (marl and

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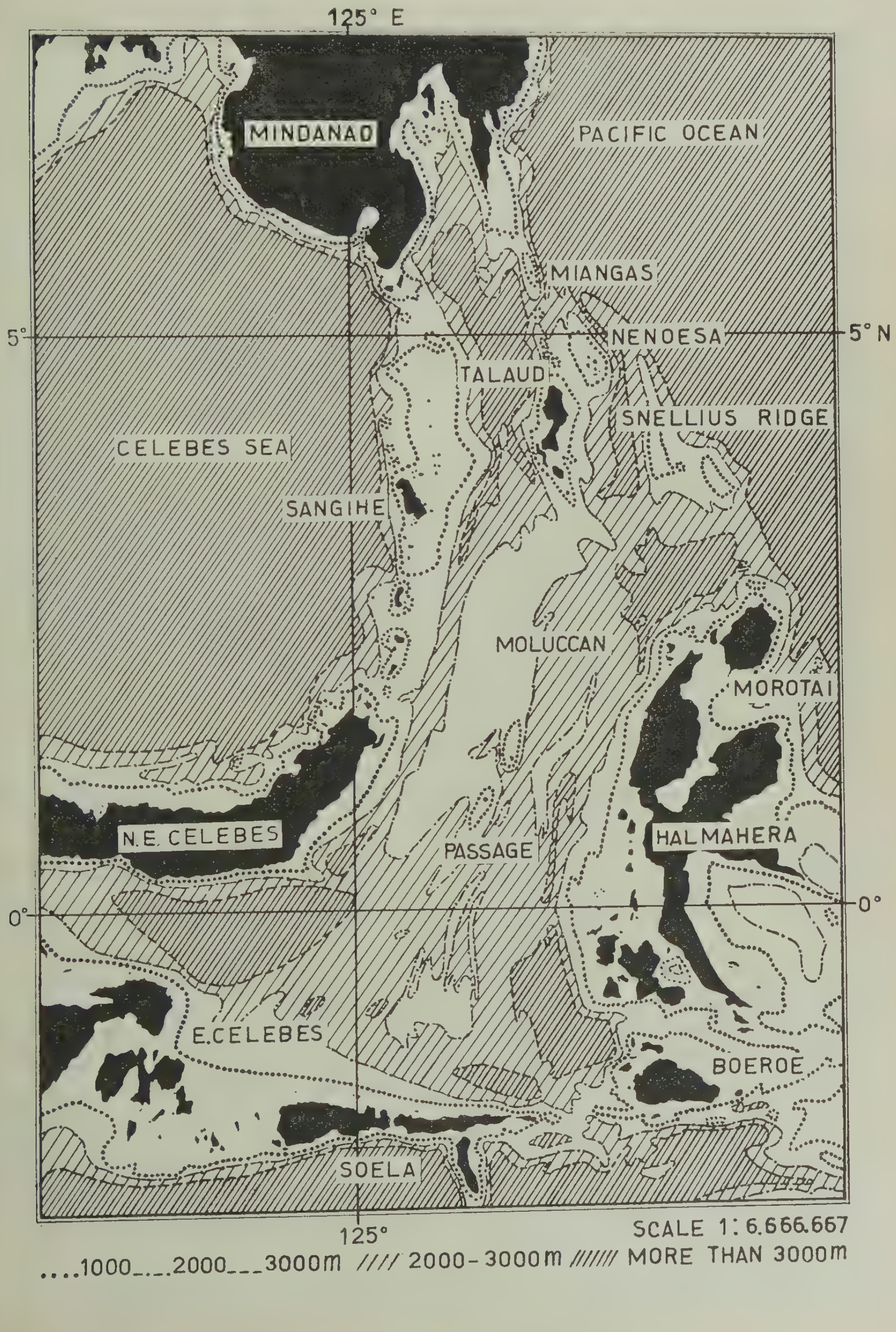
Fig. 2. — Submarine morphology of the region between the Philippines, North Celebes and the northern Moluccas (Morotai, Halmahera, Boeroe) after the chart by P. M. van Riel. For further explanation see text.


125° E
MINDANAO
PACIFIC OCEAN
MIANGAS
5°
NENOESA
5° N
TALAUD
SNELLIUS RIDGE
CELEBES SEA
SANGIHE
MOLUCCAN
MOROTAI
N.E. CELEBES
PASSAGE
HALMAHERA
0°
0°
E.CELEBES
BOEROE
SOELA
125°
SCALE 1: 6.666.667
....1000_._.2000___3000m //// 2000-3000m ////// MORE THAN 3000m

sandstone), several hundreds of metres thick, particularly in North Karakelong and in North Salebaboe. Also the central parts of the larger Nenoesa islands show these sedimentary rocks at the surface. The sandstone layers are considerably thicker than the marl which measures not more than a few metres. Both have probably been formed during a period of transgression, but neither contain any macroscopically discernable fossils, except occasional remains of carbonized plants.

In many places along the coast and also in some inland areas (particularly in S. Salebaboe, in W., N. and E. Kaboeroeang and in the smaller Nenoesa islands and Miangas) the above-mentioned sediments are again covered by coral-limestone. In most places it is continuing into the living reef although it may be considerably uplifted in the interior, showing two or three terraces with well-developed sea-cliffs indicating as many former beach lines. These terraces are often perfectly flat, having steep sides. I found the highest one at an altitude of about 150 m in the south (Kaboeroeang), of about 75 m in Nenoesa and only of about 7 m in Miangas. In many places there are indications of a very recent relative lowering of the sea-level. On the north-side of Beo bay I found perfectly whole and entire coral trunks standing upright in the soil of an abraded cliff-coast at an altitude of 2.5—3 m above sea-level.

It may be added here that two fossil coral-pieces, collected on the watershed between Beo and Rainis at an altitude of about 100 m, appeared to be specimens of *Cyphastraea serailia* Forssk. [1]) (recent from Red Sea to N.W. Australia; plio-plistocene of Timor) and *Fungia Danai* E. H. (recent from Madagascar, Ceylon, Singapore, Sumatra, Amboina and Philippines). The identifications were kindly made by Prof. J. H. F. Umbgrove at Delft.

In addition, marshy alluvial plains are found in some places near the coast.

While the surface contours of the eruptive rocks are fairly smooth and rounded, those of the sedimentary rocks show deep and very steep ravines with often perpendicular and polished sides. In their lower course, however, the rivers offer the usual — and often the only — ways to penetrate into the interior.

Regionally, the Talaud Islands seem to agree with Halmahera and Morotai, where the same type of magmatic rocks are said to be found, covered by younger sediments and uplifted coral limestone, except in the Central part. On the other hand, they might perhaps be inserted in the eastern branch of the Philippine virgation. However, the geology both of Talaud and of Halmahera is very poorly known and as far as Talaud is concerned, the structure seems to be considerably more complicate than appears from Roothaan's preliminary records. Moreover, a submarine ridge may and may not be the remainder of a former chain of islands and the geology is, at least in these regions not able to state with any certainty whether a given geanticline has ever risen to above sea-level. Thusfar, there is no sufficient geological evidence to support any suppositions regarding former land connections in these parts, let alone to fix the period of their eventual existence, and any conclusions in this field are premature.

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[1]) Forsskål, not Forskål, as the name is usually spelled (letter by Dr. K. Stephensen, Zoological Museum, Kopenhagen).

3. CLIMATE AND VEGETATION.

The climate is purely tropical. According to Boerema (Verh. 18, p. 52) both Talaud and Morotai belong to rainfall type nr. 59 with a fairly strong rainfall throughout the year and a weak minimum in the northern summer. The rainfall figures given in his paper of 1931 show that the yearly rainfall for Beo (Karakelong, west coast) is 3428 mm (average of 12 years) with a minimum of 204 mm in August and a maximum of 367 mm in December. For Liroeng (Salebaboe, north coast) the yearly rainfall is 2817 mm (average of 31 years) with a minimum of 187 mm in September and a maximum of 352 mm in June. For Wajaboela (Morotai, west coast) the yearly rainfall is 1911 mm (average of 10 years) with minimum of 82 mm in October and a maximum of 245 mm in January. In Talaud the figures may be slightly higher in the hilly interior, in Morotai they will undoubtedly be considerably higher in the mountains than in Wajaboela, as the mountain range ascends much higher than in Talaud. Yet, during the 18 days spent in the interior of North Karakelong, it rained several times, in fact almost every second day, whilst there had been no rain at all at the coast.

Both in Talaud and in Morotai the prevailing winds are north from December to April inclusive, south from June to October inclusive (Boerema, Verh. 18, map II).

In accordance with the equable rainfall and temperature throughout the year — of the latter no exact figures were available — the natural vegetation is the tropical rain forest. It covers the country up to the hill tops, which in Talaud do not surpass the 600 m contour.

Probably as a consequence partly of edaphic factors, partly of floristic differences, the forest in Talaud is not more than moderately heavy and, in general, not higher than about 30—35 m, interspersed with occasional lofty trees, whereas the Morotai forest generally attains a height of 40 or 50 m, with many heavy trees.

My original impression of the Talaud rain forest was that it is relatively poor in species. Yet, in the region which was most intensively investigated, the collection from the old forest, including the river banks, contained 229 species of which no less than 110 trees (cf. *Table I*). Probably the impression of poorness is influenced by the vegetational aspect of the forest. In general, the undergrowth is not very dense, the number of shrubs being very low. Rattans are locally abundant, particularly on the narrow ridges. Terrestrial *Araceae* and particularly epiphytical orchids are remarkably rare, but in comparison with the larger Malaysian islands also the fern flora is rather poor, though probably more so in specimens than in species. Among the epiphytes *Myrmecodia* and *Hydnophytum* are pretty well represented. Also lianas are fairly abundant. Bamboo is very rare. In some of the swamps sagu (*Metroxylon* spec.) is found, both spiny and spineless.

TABLE I.

Number of species belonging to seven life-forms in three localities.

	Trees	Shrubs	Lianes and climbers	Epiphytes	Hemi-parasytes	Herbs and undershrubs	Saprophytes	Total
Talaud, old forest Loc. 2 (hills and riverbanks) — 18 collecting days	110	7	31	25 (12 Pter., 3 Orch.)	4	46 (15 Pter., 4 Orch.)	6	229
Talaud, sec. forest nr. Beo Loc. 1	27	19	15	2	3	16 (2 Pter.)	—	82
Morotai, old forest Loc. 12 (hills and river-banks) — 11 collecting days	71	23	20	28 (12 Pter., 12 Orch.)	1	40 (18 Pter., 2 Orch.)	—	183

During my stay in the interior of North Karakelong, relatively few trees were flowering, but there were many young flowerbuds and also many fruits. This is the reason why several tree species had ultimately to be collected in a sterile state. Maybe there is a flowering time in February, and possibly another in July, if there is actually a distinct general periodicity in this respect.

In the limestone areas, where the humus layer is often very thin, the forest is distinctly different. Several trees, and among them are many which yield economically important timber, such as the valuable ebony tree (*Diospyros Rumphii*), are preferring these soils or exclusively occur there. The undergrowth in these forests is extremely scanty.

A very peculiar type of vegetation is found on the eastern slope of G. Piapi on the east coast of Karakelong, where the layer of weathered soil on the eruptiva is so thin that forest growth is prevented in many places. As far as could be ascertained this is the only example of such a deviating vegetation (and flora) in the whole group. It has given rise to some interesting folklore and has previously been dealt with in a separate paper (1927) in which the vegetation above 150 m alt. was described as recalling the subalpine flora of high mountain peaks, intermixed with coastal species. The name of this remarkable mountain has occasionally been connected with some former volcanic activity (api = fire). As no traces of such an activity have been found — the Talaud word for fire is, moreover, not "api", which is Malay, but "poetoeng'a" —

it is more likely that the name has been derived from the native name of a plant, reminding the inhabitants of certain seashore plants called *api-api* (Piapi may be an abbreviation of api-api), on account of the fact that some of the mangrove trees are generally used for fire wood.

On account of the nature of the coast, in which estuaries of some importance are lacking, the mangrove vegetation is poorly developed. Near Beo there are some plots of *Rhizophora, Bruguiera, Ceriops* and *Avicennia,* but for the rest the most common coastal tree is *Sonneratia cascolaris,* mixed with some other trees, a community which seems to occur particularly on the small capes that protrude into the see. Between these the usual *Pes-caprae* and *Barringtonia* associations are found.

In Talaud the deforestation is not yet very serious (1926). As a consequence of the poor soil the islands are sparsely populated. The villages are all situated near the coast and the interior is mostly forested, at least in Karakelong. Only in the narrow central part of the island at the latitude of Beo, and furthermore on the smaller islands, most of the forest has been cleared. Particularly in the broader northern section of Karakelong the forest seems to be practically virginal as a consequence of the fact that forest products are not (or no longer) collected. The inhabitants are indolent and do not like to leave their villages even for a few nights. This is undoubtedly partly due to the fact that the main food (*Ipomoea Batatas* and *Colocasia*) is heavy and not easy to be taken into the forest in considerable quantities for a long time. Near the villages certain plots are, since 1925, protected by a native government regulation as timber reserves. Culling permits are granted for particular quantities and for particular species. In Salebaboe and in Kaboeroeang there are only some small groves left on the highest points of the hills. The Nenoesa Islands are entirely deforested except Garete, which is an uninhabited flat coral island, which serves as an already badly cleared timber reserve for the group. In Miangas there is only a very small grove on G. Kota which is preserved as a sort of sanctuary with the ruins of an ancient fortress in which some small memorial guns are worshipped.

Near Beo the secondary forest is relatively rich. It was not particularly intensively investigated, yet I collected there 82 species, of which 27 trees (cf. *Table I*). This forest is comparatively rich in shrubs and climbers, but extremely poor in epiphytics.

In the other islands the secondary forests appeared to be much poorer. Floristic characteristics of the various associations are given in § 4.

Probably due to the scanty contact with other islands, the introduced and ruderal flora elements are still very poor. *Lantana Camara* L., which in the Minahasa was (in 1926) restricted to the immediate vicinity of Manado, had at that time not yet appeared in Talaud. Significant for the place, some of the introduced plants have come from, is the native name given to me for *Ageratum conyzoides*, viz. *radóé'oet oe manáro*, i. e. weed from Manado (capital of the Minahasa, North Celebes). Other introduced and (or) ruderal plants are *Abelmoschus moschatus, Achyranthes aspera, Asclepias curassavica, Cassia mimosoides, Emilia sonchifolia, Hyptis capitata, Scoparia dulcis, Sida* (? *rhombifolia* L.), *Stachytarpheta* *indica, Urena lobata* L., *Vernonia cinerea,* etc. The name of *Melastoma malabathricum* L. was noted by me at the time, but on second thought I am not sure it was this species I observed and not *M. polyanthum* which was collected afterwards.

As has been said above, the Morotai rain forest is very different from that in Talaud. It is much more majestic and exuberant in aspect, and possibly also in species, although this does not appear from *Table I.* It must, however, be borne in mind that I had only 11 collecting days in Morotai, against 18 in the main Talaud collecting area (Loc. 2). Moreover, a relatively larger number of Morotai species (± 50 out of ± 230) had to remain unidentified (in Talaud ± 100 out of ± 710).

The Morotai forest reminded me in many respects of the New Guinea sylva, but it is true that such psychological factors as the more Papua-like inhabitants, the avifauna, particularly the many cacatoos, hornbills and dull-cooing pigeons and the great number of enormous and heavily buttressed trees influenced this impression. The undergrowth is very dense, ferns and particularly *Selaginella* are extremely abundant. Also epiphytical Orchids are frequent and these are certainly points the country has in common with New Guinea. The swampy alluvial plains behind the beach are full of sagu. On drier grounds several very lofty trees (cf. § 4) are predominant. Next comes a narrow stretch of limestone hills (G. Ligòjer) with some characteristic trees and, finally, there is the gradual slope of the central mountain range, in which yet other lofty trees, among which the gum copal tree (*Agathis* spec.), are abundant.

4. FLORISTIC CHARACTERISTICS OF THE AREAS INVESTIGATED.

In the following enumeration the species have been mentioned in alphabetical order. The main subdivision is a geographical one, beginning with the main island of Talaud, Karakelong, proceeding with Salebaboe, Kaboeroeang, Nenoesa and Miangas, and ending with Morotai. The next subdivision used is based on the habitats within the localities and the ultimate one is according to life forms, in the sequence: trees, shrubs, lianas and climbers, epiphytes, hemiparasites, herbs and undershrubs, saprophytes, and occasionally fungi.

An exclamation mark indicates that the species was noted to be frequent or very frequent. Of trees with a height of 10 m or more, the dimension is added in brackets. Unless ± is added to this figure, the height is actually measured. In case two figures are given, that with ± is the maximum estimated height observed for the species in question. If a species was collected more than once in the same locality, only the height of the highest specimen is given.

An * asterisk means that a species has been observed only at a locality, not collected. This generally applies only to trees, the native name of which was mentioned at my request by the native expert. As far as this was possible on account of previously acquired experience in the field, the identification thus obtained was checked. Only those species have been mentioned in this way, the native names of which had proved to be constant and reliable by repeated counter-checking (cf. § 7). However, it hardly needs special emphasis that the data obtained by this method should be used with some reserve.

In some cases author's names are added. These species are wanting in the collection.

Karakelong.

LOC. 1, VICINITY OF BEO.

Sandy beach — Trees: **Cerbera manghas, Ficus procera* (± 30 m), *Pongamia pinnata* — Shrubs: *Aegiceras corniculatum, Clerodendrum inerme, *Pluchea indica Less., Premna corymbosa, Scaevola frutescens, Ximenia americana* — Herbs: *Ipomoea Pes-caprae.*

Secondary forest behind the beach — Shrubs: *Clerodendrum Buchanani, Evodia latifolia, Wedelia biflora!* — Lianas: *Parsonsia Cumingiana, Stephania hernandiifolia* — Herbs: *Crinum asiaticum, Tacca leontopetaloides.*

Mangrove Vegetation — Trees: *Avicennia marina var. Rumphiana! (± 15 m), Bruguiera conjugata!, Ceriops Roxburghiana, Rhizophora mucronata!;* only on slightly elevated coral reef: *Osbornia octodonta, Sonneratia caseolaris! (15 m)* — Shrubs: *Brownlowia Beccarii* — Lianas: *Dalbergia candenatensis!, D. meneoides, Derris heterophylla* — Herbs: *Acanthus ilicifolius, Acrostichum aureum, Mariscus pennatus* (landside) — Epiphytes: *Dendrobium Mirbelianum* (! on *Sonneratia*).

Freshwater swamp — Trees: *Barringtonia racemosa* — Shrubs: *Desmodium heterocarpum* — Herbs: *Aclisia sorzogonensis, Floscopa scandens, Hygrophila salicifolia, *Jussieua angustifolia, Polypodium longissimum.*

Coconut plantations — Shrubs and herbs: *Ageratum conyzoides, Bidens chinensis, Blumea balsamifera, B. lacera, Commelina nudiflora, Cyanotis axillaris, Dryopteris unita, Emilia sonchifolia, *Imperata cylindrica (L.) Beauv. var. Koenigii (Retz) Benth., *Leea javanica, Lygodium scandens, Schizoloma ensifolium, Vernonia cinerea* — Epiphytes: *Cyclophorus adnascens.*

Waysides — Shrubs and herbs: *Abelmoschus moschatus, Coelorhachis glandulosa, Cyperus spec. (n. 2513), Eragrostis unioloides!, Gleichenia linearis!, Hyptis capitata, Ischaemum muticum, I. polystachyum!, Jussieua linifolia, Lycopodium cernuum, Paspalum longifolium, Piper sarmentosum, *Rubus fraxinifolius ssp. celebicus, Scleria scrobiculata, Scoparia dulcis, *Sida (? rhombifolia L.), Stachytarpheta indica, *Urena lobata L., Vernonia lanceolata, *Wedelia biflora.*

Secondary forest (0—120 m alt.) — Trees: *Albizzia saponaria, Boerlageodendron serratifolium, Buchanania arborescens (20 m), Cerbera manghas (10 m), Commersonia Bartramia!, Evodia latifolia!, Ficus botryocarpa, Garcinia sizygifolia, Geniostoma celebicum, Geunsia pentandra!, Glochidion zeylanicum var. malayanum, Gnetum gnemon var. domesticum, *Hibiscus tiliaceus, Homalanthus populneus, Leucosyke capitellata!, Macaranga hispida, M. Tanarius, Maesa tetrandra!, Mallotus ricinoides, Melanolepis multiglandulosa, Melicope triphylla, Melochia umbellata, Nauclea* *mitragyna, *Oroxylon indicum Vent., Parkia javanica, *Premna corymbosa, Rhus rufa (10 m), Trema amboinensis* — Shrubs: *Acalypha amentacea!, Allophylus Cobbe!, Baccaurea spec. (n. 2657), Breynia cernua, Dalbergia ferruginea, Desmodium heterocarpum, Ehretia microphylla, Ficus leucantatoma, Ixora talaudensis, Leea javanica, Mallotus tiliifolius, Melastoma polyanthum, Morinda citrifolia, Mussaenda aff. philippica!, Pisonia umbellifera, Premna corymbosa!, Rubus fraxinifolius ssp. celebicus* — Lianas and climbers: *Cissus spec. (n. 2484), Clematis aristata, Dioscorea oppositifolia, Ficus celebica, Ipomoea tiliacea, Lygodium borneense, L. circinnatum, Medinilla pterocaula, Merremia peltata, Mucuna gigantea, Pericampylus glaucus, Piper abbreviatum, P. spec. (n. 2681), Stephania cauliflora* — Epiphytes: *Dischidia Copelandii, Myrmecodia spec. (n. 2549)* — Hemiparasites: *Amyema celebica, Ginalloa Arnottiana!, Scurrula fusca* — Herbs and undershrubs: *Alpinia pectinata!, A. pubiflora!, Centotheca latifolia!, Costus speciosus!, Elatostema polioneurum, Fimbristylis miliacea, Hemigraphis Rumphii var. angustifolia, Ilysanthes antipoda, Ischaemum muticum, Jussieua angustifolia, Nephrolepis biserrata, Ophiorrhiza spec. (n. 2566), Peristrophe bivalvis, Riedelia curviflora, Schizoloma ensifolium, Spathoglottis plicata.*

Partly cleared old forest (± 100 m alt.) — Trees: *Alphitonia zizyphoides (17 m), Alstonia scholaris! (20 m), Annonacea spec. (15 m, n. 2582), Arthrophyllum diversifolium! (15 m), Artocarpus reticulata (12 m), Barringtonia racemosa!, Boerlageodendron serratifolium, Buchanania arborescens! (34 m), Canarium asperum! (10 m), *Cinnamomum spec., Elaeocarpus dolichostylus (25 m), Eugenia ? fastigiata (12 m), E. panduriformis (20 m), E. spec. (27 m, n. 2623), E. spec. (n. 2632), E. spec. (n. 2665), Ficus heteropoda! (10 m), F. pubinervis (11 m), F. rudis! (15 m), Horsfieldia glabra! (17 m), H. novo-guineensis (20 m), Lepiniopsis ternatensis, Litsea Perrottetii (30 m), Lunasia amara, *Metroxylon spec., *Pandanus (2 sterile species), Pimeleodendron amboinicum (15 m), Pittosporum ferrugineum (11 m), Saurauia spec. (n. 2638), Sterculia Treubii! (20 m), Timonius celebicus* — Shrubs: *Desmofischera monosperma* — Lianas and climbers: *Cissus hastata, *Flagellaria indica, Merremia peltata* (forest skirt), *Myxopyrum ovatum, Piper abbreviatum, Pseudopipturus repandus, Rubiacea spec. (n. 2612), Tylophora Perrottetiana* (forest skirt), *Uncaria spec. (n. 2621)* — Epiphytes: *Hoya sussuela!* — Hemiparasites: *Ginalloa Arnottiana* — Herbs and undershrubs: *Amomum roseum, Aneilema vitiense, Aracea spec. (n. 2625), Homalomena aromatica, Microstylis purpureo-viridis, Ophiorrhiza parviflora, O. spec. (n. 2566), Schizaea dichotoma, S. digitata* — Fungi: *Lentinus Tuber-regium Fries* (with tuber).

LOC. 2, K. BAHEWA AREA.

N. Maraloem (small coral island off Lobo) — Trees: *Pandanus latissimus, Polyscias Rumphiana* — Climbers: *Cayratia japonica* — Hemiparasites: *Cassytha filiformis* — Herbs: *Euphorbia serrulata.*

Lobo, alang-alang field — Herbs and undershrubs: *Cassia mimosoides, Eulophia venosa.*

K. Bahewa, banks and bed in cultivated area

(10—20 m alt.) — Climbers: *Pueraria Thunbergiana* — Herbs: *Cyperus distans, Fimbristylis spec. (n. 3026), Ipomoea gracilis, Kyllinga brevifolia, Panicum Crus-galli, Physalis minima, Saccharum spontaneum, Torulinium ferax.*

River banks K. Bahewa and K. Tatamboewe (20—50 m alt.) — Trees: *Acalypha Caturus (15 m), Albizzia saponaria (12 m), Alsophila glauca, Anthocephalus macrophyllus (15 m), *Boerlageodendron barbatum, Bridelia glauca (14 m), Campnosperma ? oxyrhachis! (22 m), Clerodendrum japonicum, Colona scabra (11 m), Endospermum spec. (24 m, ns. 2728, 2873), Ficus spec. (n. 2721), Glochidion philippicum (20 m), G. zeylanicum var. malayanum (10 m), Gnetum gnemon var. domesticum, Hibiscus tiliaceus, Homalanthus populneus, Koordersiodendron pinnatum (23 m), Leea aculeata!, *Macaranga hispida, *M. spec. (n. 2859), Melochia umbellata, Parkia javanica (13 m), Pipturus incanus, Pygeum latifolium (27 m), Terminalia Copelandii (24 m), Villebrunea rubescens!* — Shrubs: *Acalypha amentacea, Boehmeria clidemioides, Maoutia Puya, *Psychotria leptothyrsa, Rubus fraxinifolius ssp. celebicus, Schefflera ? confinis, *Solanum torvum Sev.* — Lianas and climbers: *Cissus hastata, C. nodosa, *Epipremnopsis spec. (n. 2734), Macropsychanthus dolichobotrys, Mussaenda aff. philippica, *Passiflora quadrangularis L., *Pueraria pulcherrima, Tylophora spec. (n. 2892)* — Epiphytes: *Iaera lanaensis, Medinilla Teysmanni, Polypodium heracleum, *P. punctatum, Pteris melanocaulon, Trichosporum radicans* — Herbs and undershrubs: **Ageratum conyzoides, Alpinia pectinata, Amomum roseum, Angiopteris evecta, Argostemma spec. (n. 2890), Begonia spec. (ns. 2742, 2948, 2966, 2967), Cyrtandra coccinea (3 m), Deeringia polysperma, Dryopteris calcarata* (on rocks), *D. spec. (n. 2786a), Elatostema polioneurum, E. spec. (n. 2809), Garnotia stricta* (on rocks), *Lindsaya gracillima* (on rocks), *Mariscus cyperinus, Nephrolepis biserrata, *Riedelia curviflora, *Saccharum spontaneum, Solanum nigrum, Trichomanes humile* (on rocks).

Pasir Malap, riverbank terraces (20 m alt.) — Trees: *Couthovia celebica! (27 m), *Dracontomelum dao, Eugenia spec. (21 m, n. 2986), Gymnacranthera Ibutii (17 m), Laportea spec. (n. 3007), Litsea Forstenii (14 m), *Mischophloeus paniculatus, Palaquium obtusifolium (36 m), Pisonia umbellifera, Pometia spec. (20 m, n. 2982), Pterospermum celebicum (26 m)* — Lianas and climbers: *Adenia pandurata, Artabotrys macrantha, Connarus spec. (n. 3005), Dischidia spec. (n. 3017), Lophopyxis Maingayi, Macropsychanthus dolichobotrys, Medinilla pterocaula, Pothos Rumphii* — Epiphytes: *Myrmecodia spec. (n. 3020)* — Herbs: *Aglaonema oblongifolium, Aracea spec. (n. 2991), Calanthe spec. (n. 2989), Homalomena aromatica, Mapania spec. (n. 2990), Microstylis talaudensis, Rhaphidophora Korthalsii, Saccharum spontaneum, Schizaea digitata, Tropidia spec. (n. 3001)* — Saprophytes: *Didymoplexis minor var. salmonea, Sciaphila tenella.*

Pasir Malap, hill-forest (20—70 m alt.) — Trees: *Arthrophyllum diversifolium! (12 m), Astronia macrophylla, Canarium balsamiferum!, Cleistanthus myrianthus! (11 m), Codiaeum variegatum var. moluccanum, Cyclostemon littoralis (13 m), Discocalyx silvestris, Dracontomelum dao (21 m), Evodia minahassae (15 m), Glycosmis pentaphylla, Lunasia amara, Otophora fruticosa, Pandanus spec. (n. 2992), Trichospermum eriopodum*

(14 m) — Herbs: *Schizaea digitata* — Saprophytes: *Didymoplexis minor var. salmonea, Sciaphila tenella.*

Pasir Malap, Observed only (river terraces and hills not distinguished) — Trees: **Artocarpus elastica, *Barringtonia racemosa, *Bischofia javanica, *Buchanania arborescens, *Calophyllum soulattri, *Campnosperma ? oxyrhachis, *Elaeocarpus ? dolichostylus, *Eugenia panduriformis, *E. spec. (n. 2886), *Ficus Minahassae, *F. variegata, *Garcinia sizygifolia, *Geunsia pentandra!, *Glochidion zeylanicum var. malayanum, *Gynostylus spec. (ns. 2856, 2906), *Horsfieldia glabra, *Macaranga hispida, *M. spec. (ns. 2859 = 2894), *Palaquium luzoniense, *Palmarum spec. (n. 2916), *Pandanus spec.!, *Parkia javanica!, *Pimeleodendron amboinicum, *Planchonella firma var. microcarpa, *Pometia pinnata, *Sterculia Treubii, *Villebrunea rubescens.*

Tatamboewe camp, recent landslide — Herbs and undershrubs: *Aclisia sorzogonensis, Blumea laciniata, Centotheca latifolia, Cyrtococcum oxyphyllum, Digitaria microbachne, Elatostema spec. (n. 2778), Mariscus cyperinus, Pteris vittata, Solanum torvum.*

Tatamboewe camp, riverbank terraces (50 m alt.) — Trees: *Alangium spec. (24 m, n. 2854), *Alstonia scholaris, Boerlageodendron barbatum, Clerodendrum japonicum, Evodia glabra (18 m), *Eugenia spec. (n. 2886), Ficus botryocarpa (13 m), F. Minahassae (21 m), F. subulata, Garcinia Morella! (13 m), Inocarpus edulis! (29 m), *Koordersiodendron pinnatum, Macaranga hispida! (26 m), Mischophloeus paniculatus, Pometia pinnata! (23 m, ± 30 m), Terminalia spec. (30 m, n. 2824), T. spec. (30 m, n. 2884), Villebrunea rubescens* — Lianas: *Erythropalum scandens, Freycinetia De-Vriesei, Iodes ovalis, Pueraria pulcherrima* — Epiphytes: *Antrophyum callifolium, Appendicula reflexa, Asplenium adiantoides, A. nidus, A. tenerum, Hymenolepis mucronata, Polypodium punctatum, Thelasis micrantha* — Herbs: *Amomum roseum, Aspidium polymorphum!, Hemigraphis ceramensis, Pteris longipinnula!, Riedelia curviflora!* — Saprophytes: *Epipogum roseum.*

Tatamboewe camp, hill-forest (50—250 m alt.) — Trees: *Alsophila glauca, *Alstonia scholaris, Antidesma spec. (n. 2785), Artocarpus communis! (17 m), A. elastica! (31 m), Astronia macrophylla, Baccaurea javanica, Barringtonia racemosa (17 m), Bischofia javanica! (23 m), Buchanania arborescens (16 m), Calophyllum soulattri (28 m), Canangium odoratum (48 m), Canarium asperum! (12 m), C. balsamiferum (17 m), Cinnamomum celebicum, C. spec. (n. 2903), Cleistanthus myrianthus (15 m), Codiaeum variegatum var. moluccanum, Croton argyratus, Cyathocalyx acuminatus (18 m), Cyclostemon minahassae (15 m), Discocalyx silvestris, Dolicholobium spec. (n. 2812), Duabanga moluccana! (41 m), *Elaeocarpus dolichostylus, *Eugenia panduriformis, E. saligna (28 m), E. spec. (40 m, n. 2886), E. spec. (n. 2940), *Evodia ? glabra, Ficus botryocarpa (10 m), F. procera (45 m, ± 60 m), F. variegata (30 m), *Garcinia Morella, *G. sizygifolia, Geunsia pentandra (19 m), Gomphandra javanica (16 m), Gonystylus spec. (30 m, n. 2856), Hernandia ovigera (18 m), Horsfieldia glabra (35 m), *Inocarpus edulis, Lepiniopsis ternatensis! (21 m), Leucosyke capitellata! (13 m), Linociera ramiflora, Litsea Forstenii (10 m), *Macaranga hispida, M. spec. (ns. 2859 = 2894), Melicope* *triphylla (12 m), Memecylon costatum, Mezzettia spec. (26 m, n. 2898), Myristica celebica (23 m), Nothaphoebe umbelliflora (40 m), Palaquium luzoniense (46 m), Palmarum spec. (n. 2916), *Pandanus spec.!* (not collected), *Phaleria urens, *Pimeleodendron amboinicum, Planchonella firma var. microcarpa! (22 m), Polyalthia celebica (11 m), *Pometia pinnata!, Rinorea amboinensis, Saurauia spec.! (15 m, n. 2754), S. spec.! (n. 2883), Schuurmansia Theophrasta, Sterculia Treubii! (28 m), Terminalia spec.! (30 m, n. 2824), Turpinia pomifera (23 m)* — Shrubs: *Amaracarpus spec.! (n. 2813), Antidesma Cumingii, Breynia cernua, Psychotria leptothyrsa* — Lianas and climbers: *Adenia pandurata, Asplenium scandens, Calamus spec.* (! on ridges, *ns. 2936, 2937*), *Epipremnopsis spec. (n. 2734), Erythropalum scandens, Ficus lanata, F. recurva, Flagellaria indica, Freycinetia De-Vriesei!, F. spec. (n. 2891), Gnetum cuspidatum, Iodes ovalis, Lindsaya pectinata, Medinilla pterocaula, Pothos Rumphii, Randia multiflora, Scindapsus Cuscuaria, Tournefortia sarmentosa* (forest skirt on landslide), *Tylophora spec. (n. 2892), Uncaria longiflora, Vanieria cochinchinensis* — Epiphytes: *Asplenium adiantoides, A. nidus!, Davallia solida, Dischidia hirsuta, Elatostema spec. (n. 2735), Eria oligotricha, Hoya sussuela, Hydnophytum amboinense, H. inerme, Iaera lanaensis, Lycopodium Phlegmaria, Ophioglossum pendulum, Orchidacea spec. (n. 2804), Schefflera ? ovoidea* — Hemiparasites: *Amyema celebica, A. rigidiflora, Amylotheca stenopetala, Ginalloa Arnottiana* — Herbs and undershrubs: *Calanthe veratrifolia var. lancipetala, Cyrtandra capitellata!, Elatostema spec. (n. 2717), Eulophia squalida, Lindsaya decomposita!, L. tenuifolia, Mapania spec. (n. 2749), Microlepia manilensis, Microstylis talaudensis, Ophiorrhiza parviflora, Peristylus papuanus, Pteris longipinnula, Schizaea dichotoma, Selaginella cupressina, S. involvens!, Staurogyne? spec. (n. 2688), Trichomanes cupressoides!, T. sumatranum!, Xanthophytum spec. (n. 2696)* — Saprophytes: *Epipogum roseum, Epirixanthes elongata, Gymnosiphon spec. (n. 2817), Sciaphila spec. (n. 2865)* — Fungi: *Lentinus Tuberregium Fries.*

LOC. 8, POELOETAN — DAHANG TRAIL (sea-level).

Beach — Climbers: *Parsonsia Cumingiana.*

Waysides — Shrubs: *Fatoua japonica, Graptophyllum pictum* — Lianas: *Faradaya splendens* — Herbs and undershrubs: *Corchorus acutangulus, Echinochloa colonum!, Oldenlandia pterita, Sorghum propinquum!, Sporobolus elongatus!*

LOC. 7, G. PIAPI (magmatic rocks, 50—520 m alt.) [1]).

Field — Trees: *Trema amboinensis.*

Open sunny slope (150—520 m alt.) — Trees: *Alphitonia zizyphoides, Calophyllum Inophyllum!, Fagraea ? ternatana!, Garcinia rhizophoroides!, Glochidion rubrum, Gnetum gnemon var. silvestre, Pandanus tectorius!, Planchonella obovata!, Podocarpus neriifolia!, Psychotria spec. (n. 3252), Rauwolfia amsoniifolia, Tetraplasandra Koordersii!, Zanthoxylum Avicennae!* — Shrubs: *Aglaia spec. (n. 3322), Antirrhoea micro-*

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[1]) This list is a correction to that given in my previous paper on G. Piapi (1927).

phylla!, Decaspermum Blancoi!, D. spec. (n. 3278), Eugenia claviflora, Geniostoma celebicum, Ilex paucinervia, Litsea ? accedens!, Myrtella Beccarii!, Phyllanthus lamprophyllus!, Rapanea densiflora, Scaevola micrantha!, Styphelia moluccana!, Vaccinium Vidalii!, Wikstroemia indica! — Lianas and climbers: *Flagellaria indica, Morinda spec. (n. 3270)* — Epiphytes: *Bulbophyllum spec. (n. 3243), Hydnophytum amboinense, Polypodium obtusissimum, Polystachya flavescens* — Hemiparasites: *Amyema celebica, Cassytha filiformis* — Herbs and undershrubs: *Adiantum flabellulatum, Cladium philippinense, C. spec. (n. 3249), Dendrobium dimorphum, D. lancifolium, Dianella coerulea, Gahnia aspera, Polygala glomerata, Schizaea dichotoma, Schizoloma ovatum, Scleria lithosperma!, Selaginella spec. (n. 3240), Spathoglottis plicata, Tapeinidium moluccanum, Themeda gigantea!*

Pananasaran'a grove and adjacent forest (50—350 m alt.) — Trees: **Alphitonia zizyphoides, Alsophila Fenicis, *Alstonia scholaris!, *Arthrophyllum diversifolium, *Artocarpus communis, A. elastica, Astronia macrophylla, Buchanania arborescens (11 m), *Calophyllum soulattri!, *Canarium asperum, Canthium spec. (13 m, ns. 3293, 3310), Cleistanthus myrianthus! (14 m), *Croton laevifolius, Eugenia cymosa, E. ? fastigiata, E. panduriformis! (12 m), Garcinia cornea (10 m), *Gynostylus spec. (ns. 2856, 2906), Helicia spec. (n. 3297), *Horsfieldia glabra, *Lepiniopsis ternatensis, Litsea spec. (11 m, n. 3314), Lunasia amara, Macaranga Mappa (11 m), *M. spec. (ns. 2859 = 2894), Matthaea sancta, Myristica celebica! (10 m), Ormosia calavensis (17 m), *Palaquium luzoniense, *Phaleria urens, Pimeleodendron amboinicum! (11 m), Pittosporum ferrugineum (10 m), *Planchonella firma, P. oxyedra (13 m), Plectronia spec. (n. 3294), Rauwolfia amsoniifolia!, *Rhus rufa, *Saurauia spec.* — Shrubs: *Antidesma Cumingii, Euphorbiacea? spec. (n. 3321), Ixora talaudensis, Psychotria spec. (n. 3306)* — Lianas and climbers: *Alyxia stellata!, Gnetum cuspidatum!, Gynochthodes spec. (n. 3332), Strychnos spec. (n. 3333)* — Epiphytes: *Appendicula reflexa, Myrmecodia spec. (n. 3304), M. spec. (n. 3324), Vittaria elongata* — Hemiparasites: *Ginalloa Arnottiana* — Herbs and undershrubs: *Cyperacea spec. (n. 3318), Lycopodium cernuum, Mapania spec. (n. 3330), Microstylis purpureoviridis, M. trigonopetala.*

Salebaboe.

LOC. 3, VICINITY OF LIROENG.

Cultivated grounds and waysides — Trees: *Maesa tetrandra* — Shrubs: *Alchornea rugosa!, Clerodendrum Buchanani* (cult.), *Uraria lagopodioides* — Lianas and climbers: *Merremia tridentata ssp. hastata, Stephania hernandiifolia* — Herbs and undershrubs: *Adenostemma Lavenia!, Ajuga bracteosa, Asclepias curassivica, Biophytum sensitivum, Hedyotis vestita, Ischaemum muticum, I. polystachyum, Lindernia crustacea, Mollugo pentaphylla!, Oldenlandia biflora!, Schizoloma ensifolium!, Scleria scrobiculata!*

Secondary forest (5—350 m alt.) — Trees: **Acalypha amentacea, Albizzia saponaria!, Champereia manillana! (11 m), Clerodendrum*

*Minahassae!, Colona scabra (13 m), *Commersonia Bartramia, Cordia Myxa!, Crataeva religiosa, Dillenia spec. (n. 3072), Ehretia microphylla!, *Ficus leucantatoma, F. Minahassae!, F. subulata! (12 m), *Geunsia pentandra, *Hibiscus tiliaceus, Leea acuminata!, *Leucosyke capitellata, Micromelum minutum, *Ormosia calavensis, Pleomele spec. (n. 3075)* — Shrubs: *Dalbergia ferruginea!, Deeringia polysperma, Desmodium heterocarpum, Desmofischera monosperma, Ophiorrhiza spec. (n. 3079), *Premna corymbosa* — Lianas and climbers: *Columella corniculata, Gynochthodes spec. (n. 3137), Ipomoea congesta!, Jasminum simplicifolium, Lepistemon urceolatus, Merremia peltata, Uncaria pedicellata* — Hemiparasites: *Scurrula fusca* — Herbs and undershrubs: *Curculigo capitulata!, Donax canniformis, Elatostema polioneurum, Eulophia squalida, Helminthostachys zeylanica, Hemigraphis lanceolata, H. Rumphii var. gracilis, Homalomena aromatica!, Lepidagathis Robinsonii, Peristrophe bivalvis, Pouzolzia zeylanica!*

Partly cleared old forest, G. Ajambana (300—400 m) alt.) — Trees: *Aglaia ganggo! (15 m), Alphitonia zizyphoides! (23 m), Blumeodendron paucinervium! (12 m), Boerlageodendron serratifolium!, Canangium odoratum! (28 m), Canarium commune! (30 m), Colona scabra (18 m), Diospyros hebecarpa (15 m), Discocalyx silvestris!, Elaeocarpus spec.! (n. 3120), Elmerrillia ovalis (13 m), Eugenia ? calubcob! (17 m), E. spec.! (15 m, n. 3098), Euonymus javanicus (19 m), Ficus spec.! (n. 3125), Geniostoma celebicum, Gnetum gnemon var. domesticum, Lepiniopsis ternatensis! (12 m), Macaranga ? triloba! (16 m), Millettia spec. (n. 3163), Ormosia calavensis! (19 m), Pimeleodendron amboinicum! (11 m), Pittosporum ferrugineum (17 m), Planchonella firma var. microcarpa! (18 m), Pometia tomentosa (30 m), Pterospermum celebicum! (27 m), Rauwolfia javanica (17 m), Symplocos spec.! (25 m, n. 3097), Terminalia spec.! (17 m, n. 3167), Trichospermum eriopodum (17 m), Turpinia pomifera (20 m), Villebrunea rubescens* — Shrubs: **Alchornea rugosa, Antidesma Cumingii, Desmofischera monosperma, Melastoma polyanthum* (forest skirt), *Mycetia ? javanica, Ophiorrhiza spec. (n. 3079)* — Lianas and climbers: *Epipremnopsis spec. (n. 3143), Ficus spec. (n. 3168), Flagellaria indica!, Humata Gaimardiana, Jasminum suberosum, Millettia spec. (n. 3164), Piper abbreviatum, Psychotria ? sarmentosa, Smilax zeylanica!* — Epiphytes: *Asplenium adiantoides, Cyclophorus adnascens, Davallia solida, Dendrobium talaudense, D. spec. (n. 3171), Lycopodium Phlegmaria* — Herbs and undershrubs: *Aclisia sorzogonensis, Alpinia pectinata!, Amomum roseum, Aracea spec. (n. 3116), Aspidium Leuzeanum* (on bank of rivulet), *A. pentaphyllum, Corymborchis spec. (n. 3064), Hypolytrum spec. (n. 3069), Helminthostachys zeylanica, Homalomena spec. (n. 3115), Lindsaya tenuifolia!, Mapania spec. (n. 3141), Microstylis latifolia, M. talaudensis, M. trigonopetala, Spathoglottis plicata* (on bank of rivulet) — Saprophytes: *Didymoplexis minor var. salmonea, Galeola Kuhlii, Sciaphila spec. (n. 3107).*

Small lakes (Danan Timbalang'a and D. Bindoek'a) — Trees: **Hibiscus tiliaceus, *Macaranga hispida* — Herbs: **Aracea spec. (n. 3116), Helminthostachys zeylanica, Polygonum minus ssp. procerum, Sacciolepis aurita, Wolffia spec. (n. 3163).*

Old forest, G. Ajambana, observed only — Trees: **Albizzia sapo-*

*naria, *Alstonia scholaris, *Anthocephalus macrophyllus, *Arthrophyllum diversifolium, *Bischofia javanica, *Calophyllum soulattri, *Canarium balsamiferum, *Champereia manillana, *Dracontomelum dao, *Duabanga moluccana, *Elaeocarpus dolichostylus, *Eugenia panduriformis, *E. saligna, *E. spec. (ns. 2623, 2841, 2886), *Ficus Minahassae, *F. botryocarpa, *F. procera!, *F. pubinervis, *F. variegata!, *F. spec. (ns. 2528 = 2767 = 2814, 2581 = 2782, 2671), *Geunsia pentandra, *Gonystylus spec. (ns. 2856, 2906), *Horsfieldia glabra!, *Inocarpus edulis, *Leucosyke capitellata, *Macaranga hispida!, *M. spec. (ns. 2859 = 2894), *Mezzettia spec. (n. 2898), *Myristica ? celebica, *Notaphoebe umbelliflora, *Pometia spec. (n. 2982), *Rhus rufa, *Sterculia Treubii, *Terminalia spec. (n. 2884), *Indet. (nat. n.: saroeràn'a, prob. Commersonia Bartramia).*

LOC. 6, LOTA SWAMP NEAR MORONGE (on limestone near sea-coast).

Beach — Trees: *Pisonia silvestris, Tournefortia argentea.*

Drier parts of swamp — Trees: *Barringtonia racemosa!, Dolichandrone spathacea!*

Wetter parts of swamp — Herbs: *Caldesia reniformis!, Ceratophyllum spec. (n. 3229), Dryopteris gongylodes!, Hygrophila salicifolia, Hymenachne amplexicaulis!, Ipomoea aquatica, Jussieua angustifolia, Lemna spec. (n. 3231), Melochia concatenata!, Najas ? graminea Del. (n. 3232), Polygonum minus ssp. procerum!, Wolffia spec. (n. 3230).*

Kaboeroeang.

LOC. 4, TONAN'A AND LAPEAN'A FOREST RESERVES AND TRAILS THERETO.

Secondary forest and waysides — Trees: *Albizzia saponaria!, *Pleomele spec. (n. 3075), *Pterospermum celebicum!* — Shrubs: *Acalypha amentacea!, Alchornea rugosa!, Allophylus Cobbe!, Commersonia Bartramia, Ficus ampelas, Ixora talaudensis, Kleinhovia hospita!, Leea acuminata!, Melanolepis multiglandulosa!, *Morinda citrifolia, *Premna corymbosa* — Lianas and climbers: *Lygodium circinnatum, Piper abbreviatum, Tylophora Perrottetiana* — Herbs and undershrubs: **Cheilanthes tenuifolia, Fatoua pilosa, Nephrolepis hirsutula, Passiflora foetida!, Polypodium phymatodes!*

Partly cleared forest reserve of Tonan'a (limestone, 50—75 m alt.) — Trees: *Arthrophyllum diversifolium! (11 m), Diospyros Rumphii! (17 m), *Elaeocarpus dolichostylus, Garuga floribunda! (12 m), Koordersiodendron pinnatum! (18 m), *Macaranga ? triloba, *Terminalia spec. (n. 3167).*

Partly cleared forest reserve of Lapean'a (limestone, 75—125 m alt.) — Trees: **Alphitonia zizyphoides, *Calophyllum soulattri, *Canangium odoratum, *Elaeocarpus dolichostylus!, *Endospermum spec. (n. 2728), *Eugenia ? fastigiata, *Ficus procera, *Glochidion zeylanicum var. malayanum, *Horsfieldia glabra, Intsia bijuga! (18 m), Koordersiodendron pinnatum, *Lepiniopsis ternatensis, *Litsea Forstenii, *Macaranga ? triloba, *Mezzettia spec. (n. 2898), *Millettia spec. (n. 3123), *Pimeleodendron amboinicum!, *Pisonia umbellifera, *P. spec. (n. 2537),*

**Pometia spec. (ns. 2982, 3128), *Rhus rufa, *Pterospermum celebicum, Scolopia ? spinosa! (14 m), Strombosia philippinensis! (21 m), *Terminalia spec. (n. 3167), Timonius celebicus! (13 m).*

LOC. 5, TRAIL TO G. PADIAN'A (0—200 m alt.).

Secondary forest and grass fields — Trees: *Ficus ampelas* — Shrubs: *Chasalia curviflora* — Herbs: *Cheilanthes tenuifolia* (! in alang-alang), *Tacca palmata.*

Cleared old forest on banks of K. Ampas (limestone) — Trees: *Chisocheton spec. (15 m, n. 3204)* — Lianas and climbers: *Arcangelisia flava, Iodes philippinensis* — Herbs: *Aglaonema oblongifolium, Cyclopeltis novo-guineensis* (on rocks in rivulet), *Elatostema spec. (n. 3213;* on rocks in rivulet), *Hemigraphis alternata* — Observed only, Trees: **Alstonia scholaris!, *Arthrophyllum diversifolium, *Buchanania arborescens, *Canarium commune!, *Champereia manillana!, *Diospyros Rumphii!, *Ficus ampelas, *F. pubinervis, *Garuga floribunda, *Intsia bijuga, *Koordersiodendron pinnatum, *Pimeleodendron amboinicum!, *Pometia spec. (n. 2982), *Pterospermum celebicum, *Strombosia philippinensis!, *Terminalia spec. (n. 3167), *Turpinia pomifera!*

Cleared old forest on G. Pangangadoan'a and G. Boewid'oe wawi (sedimentary grounds) — Trees: *Bridelia minutiflora!, Eugenia ? Everettii (13 m), Planchonella firma var. typica (13 m)* — Observed only, Trees: **Arthrophyllum diversifolium, *Canarium asperum, *C. balsamiferum, *Eugenia ? calubcob, *Ficus variegata, *Litsea Forstenii, *Ormosia calavensis, *Pimeleodendron amboinicum* — Herbs: **Biophytum sensitivum.*

Nenoesa.

LOC. 10, MERAMPI (0—220 m alt.).

Secondary forest on limestone terraces — Trees: **Aglaia ganggo, Antidesma ghaesembillia!, *Boerlageodendron serratifolium, *Calophyllum, soulattri, *Canangium odoratum, *Canarium asperum, Champereia manillana, *Commersonia Bartramia, *Diospyros hebecarpa, *D. Rumphii, *Elaeocarpus spec.! (n. 3120), *Eugenia ? fastigiata, *Ficus subulata, F. spec. (n. 3427), Garcinia tetrandra, *Garuga floribunda, *Geniostoma celebicum, Glochidion zeylanicum var. malayanum!, *Guettarda speciosa, *Hibiscus tillaceus, *Horsfieldia glabra, Intsia bijuga, *Macaranga Tanarius, Melanolepis multiglandulosa!, *Palaquium obtusifolium, *Pimeleodendron amboinicum, *Pipturus argenteus, Planchonella nitida, *P. obovata, *Pleomele spec. (n. 3075), Rapanea densiflora! (10 m), Rhus rufa!!, *Sterculia ceramica, *Strombosia philippinensis, *Terminalia spec. (n. 3167), Vavaea amicorum! (15 m)* — Shrubs: **Acalypha amentacea, *Alchornea rugosa, *Allophylus Cobbe, *Breynia cernua, Desmodium umbellatum, *Ehretia microphylla, *Ficus leucantatoma, *F. retusa, *Glycosmis pentaphylla, *Premna corymbosa, Pseuderanthemum spec. (n. 3437), *Wedelia biflora* — Herbs: **Hyptis capitata, *Spathoglottis plicata.*

Cultivated areas and open plateau — Trees: **Commersonia Bartramia* — Shrubs: *Callicarpa pedunculata* — Lianas and climbers:

Gleichenia linearis!, Ipomoea digitata, Merremia tridentata ssp. hastata — Herbs and undershrubs: *Achyranthes aspera, Cassia mimosoides, Knoxia corymbosa, Lycopodium cernuum, Osbeckia zeylanica, Polanisia icosandra, Wedelia biflora.*

LOC. 11, GARETE.

Cleared forest reserve on flat coral island — Trees: **Arthrophyllum diversifolium,* **Barringtonia asiatica Kurz, Buchanania arborescens!,* **Calophyllum soulattri,* **Chisocheton spec. (n. 3204), Claoxylon longifolium,* **Colona scabra,* **Cyathocalyx ? acuminatus,* **Cyclostemon Minahassae,* **Diospyros hebecarpa,* **Elaeocarpus dolichostylus, E. multiflorus (16 m),* **Eugenia ? fastigiata, E. saligna! (13 m), E. spec.! (13 m, n. 3442),* **Ficus retusa,* **F. subulata,* **F. spec. (n. 3452),* **F. spec. (nat. n.: marapangi,* not collected), **Garcinia sizygifolia,* **G. tetrandra, Guettarda speciosa!,* **Horsfieldia glabra, Ochrosia oppositifolia!, Palaquium bataanense! (10 m), P. obtusifolium,* **Pandanus latissimus,* **P. spec. (n. 2992),* **P. spec.* (*nat. n.: anàman,* not coll.), **P. spec.* (*nat. n.: pándan'a,* not coll.), **Pimeleodendron amboinicum,* **Planchonella nitida, P. obovata (14 m),* **Rapanea densiflora, Sterculia ceramica!,* **Strombosia philippinensis,* **Terminalia spec. (n. 3167),* **Tournefortia argentea* — Shrubs: *Acalypha amentacea,* **Allophylus Cobbe, Triumfetta procumbens* — Lianas and climbers: *Flagellaria indica, Hippocratea oblongifolia* — Hemiparasites: *Cassytha filiformis* — Herbs: *Crinum asiaticum.*

Miangas.

LOC. 9, MIANGAS (0—110 m alt.).[1]

P. Baronto, flat uplifted coral islet — Trees: **Cocos nucifera L., Terminalia spec. (n. 3370)* — Shrubs: *Callicarpa candicans!, Excoecaria Agallocha, Ficus ? kallicarpa, F. retusa, Rapanea densiflora!, Tournefortia argentea* — Herbs and undershrubs: *Acalypha boehmerioides, Euphorbia Atoto!, Fimbristylis spathacea!, Monerma repens.*

On and near beach — Trees: *Tournefortia argentea!* — Shrubs: *Clerodendrum Buchanani, Colubrina asiatica!, Ficus leucantatoma,* **Pandanus latissimus,* **P. tectorius, Pemphis acidula!, Pipturus argenteus!, Scaevola frutescens!, Triumfetta procumbens* — Hemiparasites: *Cassytha filiformis!* — Herbs: *Ipomoea Pes-caprae, Tacca leontopetaloides.*

Mangrove Vegetation — Trees: *Bruguiera cylindrica, Lumnitzera littorea* — Shrubs: **Acanthus ilicifolius,* **? Ochrosia oppositifolia.*

Flat, dry cultivated area (c. cultivated) — Trees: **Albizzia saponaria,* **Areca Catechu L. (c.),* **Artocarpus communis (c.),* **A. integra (Thunb.) Merr. (c.),* **Ceiba pentandra (L.) Gaertn. (c.),* **Cocos nucifera L. (c.),* **Eugenia spec. (djamboe, c.),* **Hibiscus tiliaceus, Inocarpus edulis (10 m, c.), Palaquium obtusifolium (10 m, c.),* **Parkia javanica,* **Pimeleodendron amboinicum,* **Sesbania grandiflora (L.) Pers.* — Shrubs: **Mussaenda aff. philippica, Wedelia biflora!* — Herbs and undershrubs: *Abelmoschus Manihot forma leptodactylus (c.), Aclisia sorzogonen-*

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[1] This list is a correction to that given in my previous paper on Miangas (1932).

*sis, *Colocasia esculenta Schott (c.), Dryopteris Benoitiana, *Imperata cylindrica Beauv. var. Koenigii Benth., *Ipomoea Batatas Poir. (c.), *Musa paradisiaca L.* or *M. sapientum L. (c.), *M. textilis Née (c.), Nephrolepis biserrata, N. hirsutula, Polypodium phymatodes, *Saccharum spontaneum L. (c.), Selaginella spec. (n. 3403), Spathoglottis plicata.*

Freshwater swamps — Trees: **Inocarpus edulis, *Metroxylon spec.* — Herbs: *Cyperacea spec. (n. 3412), Cyrtosperma Merkusii (c.), Mariscus pennatus!*

G. Soro, open slope — Trees: **Albizzia saponaria, Commersonia Bartramia, Ficus ? kallicarpa, *Premna corymbosa, *Sesbania grandiflora (c.)* — Epiphytes: *Drynaria quercifolia!* — Hemiparasites: *Cassytha filiformis* — Herbs and undershrubs: *Biophytum sensitivum, Brachiaria reptans!, Fimbristylis annua!, Hemigraphis undulata, Oldenlandia biflora!, Scleria pubescens!*

G. Batoe, open slope — Trees: *Sterculia comosa* — Shrubs: *Premna corymbosa* — Herbs: *Asplenium adiantoides* (on rock), *Cenchrus Brownei, Sorghum laxiflorum!*

G. Batoe, grove (100 m alt.) — Trees: **Albizzia saponaria, Diospyros maritima, Ficus retusa, Melanolepis multiglandulosa, Pimeleodendron amboinicum* — Shrubs: *Acalypha amentacea, Breynia cernua, Desmodium gangeticum, Ehretia microphylla, Glycosmis pentaphylla!, Morinda citrifolia.*

G. Kota, grove (100 m alt.) — Trees: *Allophyllus Cobbe, Antidesma celebicum, Ficus retusa (10 m)* — Shrubs: *Triphasia trifolia* — Lianas: *Gymnema tingens, Schefflera elliptica* — Herbs: *Cyclophorus adnascens* (on rock), *Tacca palmata.*

Morotai.

LOC. 12a, WAJABOELA.

Cultivated area — Epiphytes: *Dischidia Collyris!*

LOC. 12, PILOWO — GOEGOETI (20—330 m alt.).

Marilako, bivouac and river bank (20 m alt.) — Trees: *Elaeocarpus Ganitrus (± 20 m), Eugenia ? acutangula! (± 15 m), Kleinhovia hospita! (± 10 m), Macaranga hispida! (± 10 m), Octomeles sumatrana! (40 m, ± 50 m), Oldenlandia spec. (14 m, n. 3636), Planchonella Vrièseana! (± 15 m)* — Shrubs: *Trema amboinensis* — Lianas: *Flagellaria indica!* — Herbs: *Alpinia malaccensis, Coix Lacryma-Jobi, Dryopteris invisa, Polygonum minus ssp. procerum.*

Marilako, forest on river terrace — Trees: *Aglaia argentea (15 m), *Anisoptera costata, *Canarium asperum, *C. commune!, C. decumanum! (15 m, ± 50 m), C. hirsutum, Celtis latifolia! (17 m), *Cerbera manghas, Dracontomelum dao! (30 m), *Eugenia ? acutangula, Ficus Cassidyana (± 10 m), *Gnetum gnemon, Haplolobus moluccanus! (14 m), Harpullia cupanioides, *Horsfieldia sylvestris!, Jagera serrata (± 10 m), *Lepiniopsis ternatensis!, *Palaquium Lobbianum, *Parastemon urophyllus!, *Pometia pinnata!* — Shrubs: *Allophylus sumatranus, Euphorbiacea spec. (n. 3654), Garcinia spec. (n. 3679), Leea indica!, Desmofischera* *monosperma, Mycetia ? javanica!, Psychotria leptothyrsa!, ? Tabernaemontana spec. (ns. 3658 = 3676)* — Lianas and climbers: *Momordica cochinchinensis* (forest skirt), *Tournefortia sarmentosa* (forest skirt), *Uncaria pedicellata* — Epiphytes: *Antrophyum callifolium, Myrmecodia spec.! (n. 3663)* — Herbs: *Diplazium silvaticum, Donax canniformis!, Dryopteris spec.! (n. 3643), Leptaspis urceolata, Lindsaya decomposita, Mapania spec. (n. 3661), Ophiorrhiza spec. (n. 3659), Orchidacea spec. (n. 3675), Taenitis blechnoides!*

Goegoeti, G. Ligòjer (limestone, 40—120 m alt.) — Trees: *Annonacea spec. (11 m, n. 3585), Astronia ternatana (19 m), Carallia brachiata, Dysoxylum arborescens! (± 10 m), *Garcinia spec., Gironniera celtidifolia, Grewia ceramensis (15 m), Haplolobus moluccanus! (12 m), *Homalium foetidum, *Horsfieldia Roxburghii, *Intsia bijuga, *Lepiniopsis ternatensis, Manilkara Merrilliana! (30 m, ± 40 m), Palaquium Lobbianum! (30 m), Pandanus spec., Planchonella firma var. microcarpa! (25 m), *Pometia pinnata* — Shrubs: *Aglaia spec. (n. 3596), Ardisia lanceolata, Euphorbiacea spec.! (n. 3590), Garcinia spec. (n. 3603), Kibara cuspidata, ? Trigonostemon spec.! (n. 3595)* — Lianas and climbers: *Medinilla crassinervia, Piper amboinense, Vitacea (n. 3589)* — Epiphytes: *Asplenium nidus, Cyclophorus acrostichoides, Myrmephytum spec. (n. 3602), Polypodium musifolium* — Herbs and undershrubs: *Aracea spec. (n. 3592), Aspidium decurrens, Elatostema spec. (n. 3633), Ophiorrhiza spec. (n. 3591), Phrynium spec. (n. 3598).*

Goegoeti, river bed, riverbank and adjoining forest on river terrace (± 40 m alt.) — Trees: *Allophylus sumatranus, Dracontomelum dao (20 m), Endospermum formicarum! (20 m), Eugenia ? acutangula (35 m), Laportea amplissima! (± 10 m), Pipturus velutinus, Polyscias nodosa (13 m)* — Shrubs: *Ficus spec.! (n. 3573;* rheophyte, possibly the same species as collected by me in New Guinea, *Lam n. 1285* [1])), *Piper spec. (n. 3619)* — Lianas: *Conocephalus suaveolens!, Gynostemma pedatum, Uncaria setiloba* — Epiphytes: *Drynaria rigidula!* — Hemiparasites: *Dicymanthes hexameres* — Herbs: *Aclisia sorzogonensis, Begonia spec. (n. 3605), Costus speciosus, Hemigraphis stenophylla, Impatiens spec. (n. 3575), Sorghum propinquum.*

Goegoeti, hill-forest (40—330 m alt.) (*a.* adventitious along mountain trail) — Trees: *Aglaia argentea, A. ganggo, A. spec.! (n. 3506), Anisoptera costata (30 m), Annonacea spec.! (40 m, n. 3496), Barringtonia acuminata, Boerlageodendron spec. (n. 3514), Buchanania arborescens (15 m), Calophyllum soulattri (25 m, ± 40 m), Canarium asperum! (18 m), C. commune (30 m), C. lian! (15 m), Castanopsis javanica! (20 m), Cerbera manghas! (15 m), Colona serratifolia, Conandrium spec.! (n. 3575), Elaeocarpus gigantifolius, Eugenia claviflora, E. formosa!, E. spec. (10 m, n. 3460), Flacourtia spec. (n. 3568), Gironniera celtidifolia, Gnetum gnemon var. domesticum, Gomphandra australiana (10 m), Gronophyllum ? microcarpum, Gyrinopsis Cumingiana, Haplolobus moluccanus, Homalium foetidum! (20 m), Horsfieldia globularia, H. Roxburghii!*

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[1]) Cf. Lam, H. J., Fragmenta Papuana V — Nat. Tijdschr. Ned. Ind. 88, 1928, 255, fig. 30 (p. 257).

*(24 m), H. sylvestris! (20 m), *Intsia bijuga (± 40 m), Lauracea spec. (n. 3511), Lepiniopsis ternatensis (12 m), Memecylon protrusum, Notaphoebe umbelliflora (30 m), Palaquium Lobbianum!, Parastemon urophyllus (28 m), Polyalthia laterifolia (30 m), *Pometia pinnata!, Psychotria spec. (n. 3474), P. spec. (n. 3535), Timonius spec. (n. 3542), Vatica papuana! (20 m)* — Shrubs: *Alchornea rugosa (a.), Amaracarpus spec. (n. 3513), Claoxylon longifolium, Cleistanthus megacarpus, Cyrtandra ? pallida, Ficus spec. (n. 3541), Lachnostoma apoda, Desmofischera monosperma, ? Olacacea spec. (n. 3571), Osmelia philippina* — Lianas and climbers: *Calamus spec.! (n. 3527), Embelia coriacea, Ficus falcata!, *Freycinetia spec., Mastersia Bakeri, Piper villilimbum, *Pothos spec., Psychotria spec. (n. 3512), Santaloides (ns. 3458, 3569), Uvaria purpurea* — Epiphytes: *Antrophyum callifolium, Asplenium adiantoides, A. nidus, A. scolopendrioides, Bulbophyllum spec. (n. 3494), B. spec. (n. 3523), Calymnanthera ? paniculata, Ceratostylis spec. (n. 3554), Dendrobium hydrophilum, D. quadrialatum, *Dischidia spec., Drynaria sparsisora!, Eria spec. (n. 3549), Hydnophytum philippinense!, Lycopodium pinifolium!, Monogramma paradoxa, Orchidacea spec. (n. 3480), O. spec. (n. 3521), Podochilus Lamii, Polypodium obtussisimum, Robiquetia spec. (n. 3483), Taeniophyllum spec. (n. 3482), Vittaria elongata* — Herbs and undershrubs: *Aspidium pentaphyllum, Centotheca latifolia (a.), Curculigo capitulata!, Cyperacea spec.! (n. 3465), C. spec.! (n. 3606), Dryopteris spec. (n. 3517), Elatostema spec. (n. 3520), Hemigraphis Rumphii var. pubescens, Lindsaya concinna!, L. tenuifolia, Mapania spec.! (ns. 3479, 3546), Microstegium fasciculatum (a.), Ophiorrhiza spec. (n. 3488), Oplismenus undulatifolius (a), Plocoglottis spec. (n. 3558), Polypodium harpophyllum, Schizaea dichotoma, Selaginella asperulipes!, S. caudata!, S. cupressina!, S. Gaudichaudiana!, Tapeinidium moluccanum!, Taenitis blechnoides!, Trichomanes rhomboideum, Zingiberacea spec. (n. 3559).*

5. PHYTOGEOGRAPHICAL NOTES.

It hardly needs to be emphasized that, in view of the facts that only a part of the material was identified by specialists and that the flora of these and of the surrounding islands is still very insufficiently known, the value of the following phytogeographical notes should not be overestimated. They merely may serve as a basis for further work in this field.

In order to investigate whether, and if so, to what degree, the present collection gives rise to any phytogeographical considerations, we distributed the species enumerated in the Systematic Part of this paper, according to their areas to the following groups:

1. Large concentric areas: I. Cosmopolitic; II. Pantropic; III. Paleotropic; IV. Old World Wides, A. East Africa (Madagascar, Mascarenes) to Polynesia, B. India (Seychelles, Ceylon), Burma, Siam, Indo China or China (in a few cases also Japan) to Polynesia.

2. Large excentric areas: V. Western Element, A. East Africa, etc. (cf. IV. A) to Moluccas or New Guinea, B. India, etc. (cf. IV. B) to Moluccas or New Guinea; VI. Eastern Element, A. Polynesia to Western Malaysia (Malay Peninsula and Formosa inclusive), B. Polynesia to Central Malaysia.

3. Malaysian areas: VII, A. Malaysian Wides (the whole of Malaysia, Malay Peninsula, the Philippines and New Guinea inclusive; in some few cases Burma, Formosa, the Bismarck Archipelago and the Solomon Islands have also been included), B. Central or Eastern Malaysian areas, C. Areas of species collected in Morotai, and restricted to the Moluccas, D. Areas of direct value to the phytogeography of Talaud or Morotai (additional evidence is provided by some species of the groups V. B, VI. B and VII. A, B, and C.

As appears from Table II, the total number of species treated was 611, 386 of which were finally, the other 225 provisionally identified; there were 524 from Talaud or from both Talaud and Morotai, and 87 from Morotai only. The number of endemics have been mentioned in brackets. That this number is small is, of course, mainly due to the fact that about 100 species from Talaud and about 50 from Morotai remained unidentified (cf. Systematic Part, § § 2 and 3) and particularly among them a number of new species may be expected (cf. the preliminary elaboration of the Rubiaceae).

Enumeration of the species according to their area-groups.

For each area-type the species have been arranged alphabetically within the main taxonomic groups Pteridophytes, Gymnosperms, Monocotyledons and Dicotyledons. Moreover, they have been arranged according to whether their identification was "final" (F), or "provisional" (P). A single * asterisk denotes species or varieties previously described, a double ** asterisk such as were described in the present paper. M. means collected in Morotai only, the other species were collected in Talaud or both in Talaud and in Morotai; if necessary the first-named condition has been stipulated by T. For the signification of W. and E., see Table II; (rel.) means that the phytogeographical relation is based upon a systematical relation, not upon direct geographical evidence.

I. Cosmopolitic — Dicotyledons, **F.**: *Solanum nigrum.*

II. Pantropic — Pteridophytes, **F.**: *Acrostichum aureum, Diplazium sylvaticum* (M.), *Dryopteris gongylodes, Gleichenia linearis, Lycopodium cernuum, Nephrolepis biserrata, N. hirsutula* — Monocotyledons, **F.**: *Brachiaria reptans, Coix Lacryma-Jobi* (orig. paleotr.), *Commelina nudiflora, Echinochloa colonum, Polystachya flavescens;* **P.**: *Cyperus distans, Fimbristylis annua, F. miliacea, F. spathacea, Kyllinga brevifolia, Panicum Crus-galli, Rhynchospora corymbosa, Scleria lithosperma, Torulinium ferax* — Dicotyledons, **F.**: *Achyranthes aspera, Ageratum conyzoides* (orig. neotr.), *Asclepias curassavica, Biophytum sensitivum, Cassytha filiformis, Corchorus acutangulus, Emilia sonchifolia, Graptophyllum pictum, Guettarda speciosa, Hyptis capitata, Ipomoea aquatica, I. congesta, I. digitata, I. Pes-caprae ssp. brasiliensis, Jussieua angustifolia, J. linifolia, Melochia concatenata, Passiflora foetida, Physalis minima, Polanisia icosandra, Scoparia dulcis, Solanum torvum, Vernonia cinerea;* **P.**: *Abelmoschus Manihot, A. moschatus, Hibiscus tiliaceus, Triphasia trifolia, Ximenia americana.*

III. Paleotropic — Pteridophytes, **F.**: *Angiopteris evecta, Asplenium adiantoides, A. nidus, Cyclophorus adnascens, Lycopodium Phleg-*

TABLE II.

Geographic distribution of the species, enumerated in the Systematic Part.

AREA			Identifications						Grand Total		
			Final			Provisional					
Nr.	TYPE		TAL.	MOR.	Total	TAL.	MOR.	Total	TAL.	MOR.	Total
I	Cosmopolitic		1	—	1	—	—	—	1	—	1
II	Pantropic		34	1	35	14	—	14	48	1	49
III	Paleotropic		20	1	21	6	—	6	26	1	27
IV	Old World Wides	A	25	—	25	8	1	9	33	1	34
		B	49	5	54	14	1	15	63	6	69
V	Western Element	A	1	—	1	—	—	—	1	—	1
		B	41 (7 W.)	2	43	31 (6 W.)	8 (1 W.)	39	72 (13 W.)	10 (1 W.)	82
VI	Eastern Element	A	9	—	9	5	—	5	14	—	14
		B	5 (1 E.)	—	5	1 (1 E.)	—	1	6 (2 E.)	—	6
VII	Malaysian Areas	A	41 (4 W.)	10 (3 W.)	51	56 (22 W.)	11 (5 W.)	67	97 (26 W.)	21 (8 W.)	118
		B	25	7	32	16	3	19	41	10	51
		C	—	9	9	—	2	2	—	11	11
		D	82	18	100	40 (1 E.)	8	48	122 (1 E.)	26	148
	Totals		333 (11 W., 1 E.) (20 end.)	53 (3 W.) (9 end.)	386	191 (28 W., 2 E.)	34 (6 W.)	225	524 (38 W., 3 E.)	87 (9 W.)	611

TAL. collected in Talaud or in Talaud and Morotai — MOR. collected in Morotai only — W., E. Species of the western (eastern) element, reaching their eastern (western) limit here.

maria, Polypodium harpophyllum (M.), *P. phymatodes, P. punctatum, Schizoloma ensifolium, Taenitis blechnoides* — Monocotyledons, **F.**: *Epipogum roseum* (exc. Polynesia) *Tacca leontopetaloides;* **P.**: *Flagellaria indica, Mariscus pennatus* — Dicotyledons, **F.**: *Acanthus ilicifolius, Bidens chinensis, Colubrina asiatica, Cordia Myxa, Desmodium gangeticum, D. heterocarpum, Kleinhovia hospita, Lindernia crustacea, Pemphis acidula;* **P.**: *Alstonia scholaris, Antidesma ghaesembilla, Bruguiera conjugata, Rhizophora mucronata.*

IV. Old World Wides.

A. East Africa, etc. to Polynesia — Pteridophytes, **F.**: *Antrophyum callifolium, Dryopteris unita, Schizaea dichotoma, Trichomanes cupressoides* — Monocotyledons, **F.**: *Caldesia reniformis, Cyrtococcum oxyphyllum;* **P.**: *Oplismenus undulatifolius* (M.; Europe to Australia), *Pandanus tectorius* — Dicotyledons, **F.**: *Blumea lacera, Callicarpa candicans, Clerodendrum inerme, Derris heterophylla, Desmodium umbellatum, Hernandia ovigera, Inocarpus edulis, Intsia bijuga, Ipomoea gracilis, Melochia umbellata, Merremia peltata, M. tridentata, Pipturus velutinus, Pongamia pinnata, Premna corymbosa, Scaevola frutescens, Tournefortia argentea, T. sarmentosa, Triumfetta procumbens;* **P.**: *Calophyllum Inophyllum, C. soulattri, Eugenia cymosa, Euphorbia Atoto, E. serrulata, Sonneratia caseolaris, Vanieria cochinchinensis.*

B. India, etc. to Polynesia — Pteridophytes, **F.**: *Aspidium decurrens* (M.), *A. Leuzeanum, Asplenium tenerum, Cheilanthes tenuifolia, Cyclophorus acrostichoides* (M.), *Davallia solida, Drynaria quercifolia, D. rigidula* (M.), *D. sparsisora* (M.), *Dryopteris calcarata, Helminthostachys zeylanica, Humata Gaimardiana, Hymenolepis mucronata, Lindsaya decomposita, Lygodium circinnatum, L. scandens, Monogramma paradoxa* (M.), *Ophioglossum pendulum, Polypodium longispinum, Pteris longipinnula, P. vittata, Schizaea digitata, Vittaria elongata* — Gymnosperms, **F.**: *Gnetum gnemon, Podocarpus neriifolia* — Monocotyledons, **F.**: *Aclisia sorzogonensis, Centotheca latifolia, Cyanotis axillaris, Floscopa scandens, Ischaemum muticum, Paspalum longifolium;* **P.**: *Crinum asiaticum, Curculigo capitulata, Homalomena aromatica, Mariscus cyperinus, Monerma repens, Saccharum spontaneum, Scleria scrobiculata, Smilax zeylanica* — Dicotyledons, **F.**: *Adenostemma Lavenia, Aegiceras corniculatum, Allophylus Cobbe, Alyxia stellata, Bischofia javanica, Cassia mimosoides, Cerbera manghas, Commersonia Bartramia, Ehretia microphylla, Excoecaria Agallocha, Lumnitzera littorea, Melanolepis multiglandulosa, Melastoma polyanthum, Morinda citrifolia, Mucuna gigantea, Ochrosia oppositifolia, Oldenlandia biflora, Osbeckia zeylanica, Pittosporum ferrugineum, Planchonella obovata, Pouzolzia zeylanica, Pueraria Thunbergiana, Wedelia biflora;* **P.**: *Barringtonia racemosa, Claoxylon longifolium, Crataeva religiosa, Elaeocarpus Ganitrus* (M.), *Micromelum minutum, Stephania hernandiifolia, Trema amboinensis.*

V. Western Element.

A. East Africa, etc. to Malaysia — Dicotyledons, **F.**: *Ajuga bracteosa.*

B. India, etc. to Malaysia — Pteridophytes, **F.**: *Adi-*

antum flabellatum, Alsophila glauca, Aspidium polymorphum (W., T.), *Lindsaya pectinata, Selaginella involvens* — Monocotyledons, **F.**: *Calanthe veratrifolia, Cenchrus Brownei* (also trop. Amer.), *Eragrostis unioloides, Galeola Kuhlii* (W., T.), *Garnotia stricta, Hymenachne amplexicaulis* (also trop. Amer.), *Ischaemum polystachyum, Microstylis latifolia, Sacciolepis aurita* (W., T.), *Sorghum propinquum;* **P.**: *Alpinia malaccensis* (M.), *Dioscorea oppositifolia, Leptaspis urceolata* (M.), *Microstegium fasciculatum* (M.) (W., M.), *Scleria hebecarpa var. pubescens, Sporobolus elongatus* — Dicotyledons, **F.**: ***Artabotrys macrantha* (rel.), *Blumea balsamifera, B. laciniata, Boehmeria clidemioides, Chasalia curviflora* (W., T.), *Clerodendrum japonicum, Dalbergia candenatensis, Dolichandrone spathacea, Euonymus javanicus, Gymnema tingens, Gynostemma pedatum* (M.), *Hedyotis vestita, Hippocratea oblongifolia, Hygrophila salicifolia, Ilysanthes antipoda, Knoxia corymbosa, Mollugo pentaphylla, Momordica cochinchinensis* (M.), *Oldenlandia pterita* (W., T.), *Parkia javanica* (W., T.), *Pericampylus glaucus, Peristrophe bivalvis, Piper sarmentosum, Planchonella nitida, Scolopia spinosa* (W., T.), *Stachytarpheta indica, Turpinia pomifera, Uraria lagopodioides;* **P.**: *Alchornea rugosa, Bruguiera cylindrica, Buchanania arborescens* (W., T.), *Carallia brachiata, Ceriops Roxburghiana, Champereia manillana, Cissus hastata* (W., T.), *Cleistanthus myrianthus, Columella corniculata* (W., T.), *Conocephalus suaveolens* (M.), *Croton argyratus, Dysoxylum arborescens, Erythropalum scandens* (W., T.), *Eugenia claviflora* (W., T.), *E. saligna, Evodia latifolia, Fatoua pilosa, Ficus falcata* (M.), *F. leucantatoma, F. retusa, F. subulata, F. variegata, Garcinia Morella* (W., T.), *Glycosmis pentaphylla, Harpullia cupanioides* (M.), *Leea indica* (M.), *Linociera ramiflora, Maoutia Puya, Otophora fruticosa, Polygala glomerata, Uvaria purpurea* (M.), *Wikstroemia indica, Zanthoxylum Avicennae.*

VI. Eastern Element.

A. Polynesia to Western Malaysia — Pteridophytes, **F.**: *Trichomanes humile, T. millefolium* — Monocotyledons, **F.**: *Coelorhachis glandulosa, Tacca palmata* — Dicotyledons, **F.**: *Lophopyxis Maingayi, Pipturus argenteus, P. incanus, Planchonella oxyedra, Pseudopipturus repandus;* **P.**: *Acalypha boehmerioides, Jasminum simplicifolium, Mallotus tiliifolius, Pisonia umbellifera, Pometia pinnata.*

B. Polynesia to Central Malaysia — Gymnosperms, **F.**: *Gnetum gnemon var. sylvestre* (3.4.5) 1) — Monocotyledons, **F.**: *Gahnia aspera* (3-4-5-5a) — Dicotyledons, **F.**: *Clematis aristata* (E., T.) (3), *Faradaya splendens* (3-4. 5a), *Lepistemon urceolatus* (3-4. 5. 5a); **P.**: *Codiaeum variegatum* (E., T.).

VII. Malaysian areas.

A. Malaysian Wides — Pteridophytes, **F.**: *Lycopodium pinifolium* (M.), *Polypodium heracleum, P. musifolium* (M.), *Selaginella caudata* (M.), *Trichomanes rhomboideum* (M.), *T. sumatranum* — Gymnosperms, **F.**: *Gnetum cuspidatum* — Monocotyledons, **F.**: *Appendiculata reflexa, Didymoplexis minor var.* **salmonea, Digitaria*

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1) See under VII. D.

microbachne, Donax canniformis, Eulophia squalida, Thelasis micrantha (W., T.); **P.**: *Aglaonema oblongifolium, Costus speciosus, Cyrtosperma Merkusii, Rhaphidophora Korthalsii* (W., T.), *Sciaphila tenella* (W., T.), *Scindapsus Cuscuaria* — Dicotyledons, **F.**: *Anisoptera costata* (M.) (W., M.), *Antidesma celebicum, Arcangelisia flava, Argostemma prob. n. sp.* (rel.), *Astronia macrophylla, Avicennia marina* (E. Afr. to Austr.) *var. Rumphiana, Callicarpa pedunculata, Canangium odoratum* (W., T.), *Canarium hirsutum f. typicum* (M.) (W., M.), *Clerodendrum Buchanani, Dalbergia meneoides* (W., T.), *Deeringia polysperma, Diospyros maritima, Duabanga moluccana, Embelia coriacea* (M.) (W., M.), *Garuga floribunda, Geunsia pentandra, **Gymnacranthera Ibutii* (rel.), ***Hemigraphis undulata* (rel.), *Homalanthus populneus, Laportea amplissima* (M.), *Macaranga Tanarius, Mallotus ricinoides, Medinilla pterocaula, Memecylon costatum, **M. protrusum* (M., rel.), *Mycetia javanica, Octomeles sumatrana* (M.), *Osbornia octodonta, Palaquium obtusifolium, Parsonsia Cumingiana, Phyllanthus lamprophyllus, Piper abbreviatum* (W., T.), *Planchonella firma, Polygonum minus ssp. procerum, Psychotria sarmentosa, Scurrula fusca, Uncaria pedicellata, Villebrunea rubescens;* **P.**: *Acalypha amentacea, A. Caturus, Aglaia argentea* (M.), *A. ganggo, Allophylus sumatranus* (M.), *Ardisia lanceolata* (M.) (W., M.), *Arthrophyllum diversifolium, Artocarpus elastica, Baccaurea javanica* (W., T.), *Breynia cernua, Bridelia glauca, B. minutiflora, Campnosperma oxyrhachis* (W., T.), *Castanopsis javanica* (M.) (W., M.), *Cissus nodosa* (W., T.), *Croton laevifolius, Cyclostemon Minahassae* (W., T.), *Cyrtandra coccinea* (W., T.), *Dischidia Collyris* (M.), *D. hirsuta, Epirixanthes elongata* (W., T.), *Eugenia fastigiata* (W., T.), *E. formosa* (M.), *Euphorbia serrulata (hairy form), Evodia glabra, Ficus ampelas, F. celebica, F. kallicarpa* (W., T.), *F. lanata* (W., T.), *F. procera, F. pubinervis* (W., T.), *F. recurva, Garcinia sizygifolia, Glochidion philippicum, G. rubrum* (W., T.), *G. zeylanicum* (India to Malaysia) *var. malayanum, Gomphandra javanica* (W., T.), *Horsfieldia glabra* (W., T.), *H. globularia* (M.) (W., M.), *H. sylvestris* (M.), *Iodes ovalis, Leea aculeata, L. acuminata, L. javanica, Leucosyke capitellata, Lunasia amara, Macaranga triloba* (W., T.), *Notaphoebe umbelliflora* (W., T.), *Parastemon urophyllus* (M.) (W., M.), *Phaleria urens* (W., T.), *Pisonia sylvestris, Polyalthia laterifolia* (M.) (W., M.), *Polyscias nodosa* (M.), *Pometia tomentosa* (W., T.), *Pygeum latifolium* (W., T.), *Rauwolfia javanica* (W., T.), *Rhus rufa, Schefflera confinis, S. elliptica, Trichosporum radicans* (W., T.).

B. Central and Eastern Malaysia — Pteridophytes, **F.**: *Lygodium borneense* (BT [1]), *Tapeinidium moluccanum* (3. 4. 4a) [2] (BCT +) — Monocotyledons, **F.**: *Dendrobium Koordersii* (M.) (4d), *D. lancifolium* (3) (CTM), **Microstylis talaudensis* (rel.) (3-4a) (CTM), *M. trigonopetala* (CT), **Podochilus Lamii* (M.) (rel.); **P.**: *Alpinia pectinata* (CT), *Amomum roseum* (3. 4a) (CTM), *Freycinetia De-Vriesei* (3) (CTM), *Mischophloeus paniculatus* (3) (CTM +) — Dicotyledons, **F.**: *Amylotheca stenopetala* (CT +), *Brownlowia Beccarii* (BCT), *Canarium asperum* (2. 3. 4), *C. balsamiferum* (3. 4a) (CTM), *C.*

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[1] For explanation see below.

[2] See under VII. B.

commune (3), *Clerodendrum Minahassae* (CT), *Colona scabra* (3) (CTM), *Diospyros Rumphii* (3) (CTM), *Elatostema polioneurum* (3-4a) (CTM), *Elmerrillia ovalis* (CT), *Geniostoma celebicum* (CT), *Ginalloa Arnottiana* (1. 2), *Hemigraphis alternata, H. stenophylla* (M.) (4d?), *Homalium foetidum* (M.), ***Jasminum suberosum* (rel., CT), *Mastersia Bakeri* (M.) (4d), *Medinilla crassinervia* (M.), *Ophiorrhiza parviflora* (CT +), *Piper amboinicum* (M.) (4d), *Planchonella firma var. microcarpa* (3. 4a) (CTM), *Pterospermum celebicum* (CT), *Randia multiflora* (rel., 2), *Timonius celebicus* (CT); **P.**: *Artocarpus reticulata* (3) (CTM), *Barringtonia acuminata* (M.), *Buchanania amboinensis* (M.), *Cinnamomum celebicum* (CT), *Evodia Minahassae* (CT), *Ficus botryocarpa* (CT), *Gomphandra australiana* (Austr., New Guinea, Morotai, Celebes) *var. celebica* (M.), *Litsea accedens* (BCT), *L. Forstenii* (3) (CTM), *Myristica celebica* (CT), *Polyalthia celebica* (CT), *Polyscias Rumphiana* (3. 4. 4a) (CTM), *Rauwolfia amsoniifolia* (3. 4) (CTM +), *Rubus fraxinifolius ssp. celebicus, Stephania cauliflora* (CT), *Tetraplasandra Koordersii* (CT).

Group VII. B comprises a number of species which later on possibly will appear to belong to VII. D, i. e. the areas of which are supposedly incompletely known in so far as one or more links are missing at the time being. Our present knowledge of the phytogeographical relations between the islands of Central Malaysia, as appearing from the papers of E. D. Merrill and others (cf. Lam, l. c., 1938), supported by geological evidence (Lam, l. c., 147—151), permits us, in my opinion, to base considerations in this field upon the hypothesis that, for instance, there has never been a direct connection between Borneo and Talaud, and between Borneo and the Moluccas, and possibly not between North Celebes and Talaud and between North Celebes and the Northern Moluccas either, other than through the Southern Philippines. There is, however, a distinct direct phytogeographical connection between Central Celebes (east arm) and the Southern Moluccas.

From this point of view such areas as Borneo-Talaud and Celebes-Talaud possibly have, at least partly, to be considered incomplete in that the Philippine links are missing (see further the end of the present paragraph, p. 125). In view of these considerations the following areas out of the 51 mentioned under VII. B, deserve special attention:

Celebes-Talaud (not known from the Philippines), 15 species marked (CT) in the above enumeration, 1 moreover in Salajar and 1 in Salajar and Flores, both marked (CT +).

Celebes-Talaud-Moluccas, 12 species marked (CTM) in the above enumeration, 2 moreover in New Guinea (1 of which moreover in Timor), both marked (CTM +).

Borneo-Celebes-Talaud, 2 species, marked (BCT), 1 moreover in the Moluccas and New Guinea, marked (BCT +).

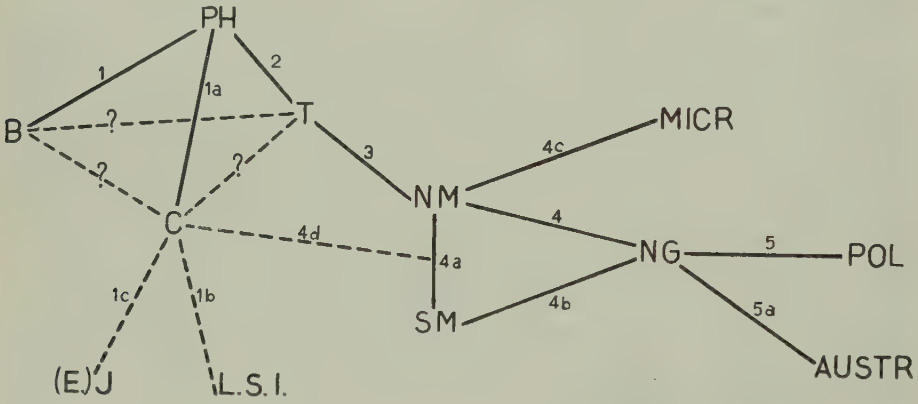
Borneo-Talaud, 1 species, marked (BT).

The remaining species either indicate the Central Celebes to Southern Moluccas connection or include this or one of the above-mentioned areas. Some few are known only from Borneo and (or) Celebes and the Moluccas, not from the Philippines and Talaud (*Barringtonia ac., Buchanania arb., Gomphandra austr. var., Hemigraphis sten., Homalium foet., Medinilla cr.*).

C. Moluccan Areas of Morotai plants (N. northern Moluccas only, Obi-Morotai; NS. both northern and southern Moluccas) — Pteridophytes, **F.**: *Selaginella asperulipes* (N.) — Dicotyledons, **F.**: *Astronia ternatana* (NS.) (4a), *Canarium lian* (N.), *Grewia ceramensis* (NS.) (4a), *Haplolobus moluccanus* (NS.) (4a), *Horsfieldia Roxburghii* (NS.) (4a), *Lachnostoma apodum* (NS.) (4a), *Palaquium Lobbianum* (N.), *Planchonella Vrieseana* (NS.) (4a); **P.**: *Gronophyllum microcarpum* (NS.) (4a), *Jagera serrata* (NS.) (4a).

D. Areas more directly significant for the phytogeography of Talaud and Morotai.

In order to investigate the importance of the single areas of this group, we will make use of the following scheme, in which all phytogeographically possible connections are indicated by a number. For each of the species of the present group these numbers have been mentioned, as has been done for those species of the groups VI. B and VII. B which, though covering a larger area, are partly significant for the phytogeography of Talaud and (or) Morotai.



B. Borneo, PH. Philippines, T. Talaud, NM. Northern Moluccas (Morotai inclusive), NG. New Guinea, POL. Polynesia, C. Celebes, (E.) J. (East) Java, L.S.I. Lesser Sunda Islands, SM. Southern Moluccas, MICR. Micronesia, AUSTR. Australia.

If a connection between two not immediately adjacent regions is indicated by an uninterrupted area, the numbers in question are separated by a point, if, however, the area is interrupted, they are separated by a hyphen. For instance, if a species is known to occur in the Philippines as well as in Talaud and in Morotai (or in any other island in the Northern Moluccas), its distribution has been indicated by (2. 3); if, however, it is only known from the Philippines and Morotai (or, in general, the Northern Moluccas), not from Talaud, its symbol is (2-3); if, finally, it is known from Talaud, and the nearest relations are found in the Philippines and in the Northern Moluccas, its area is symbolized by (rel.) (2. 3), etc.

Pteridophytes, **F.**: *Alsophila Fenicis* (2. 3), *Aspidium pentaphyllum* (3. 4), *Asplenium scandens* (1. 2. 3. 4-5), *A. scolopendrioides* (M.)

(1. 2. 3. 4), *Cyclopeltis novoguineensis* (3-4), *Dryopteris Benoitiana* (3), *D. invisa* (2-3. 4. 5), *D. spec.* (3-4), *Lindsaya concinna* (M.) (1. 2-3), *L. gracillima* (2), *L. tenuifolia* (1c?-2-3. 4. 5), *Microlepia manilensis* (1c? 1a. 2), *Polypodium obtusissimum* (2. 3), *Pteris melanocaulon* (2. 3. 4a), *Selaginella cupressina* (1c?-2. 3), *S. Gaudichaudiana* (M.) (4a. 4b), *Schizoloma ovatum* (1. 1a. 2) — Gymnosperms, **F.**: *Gnetum gnemon var. domesticum* (1a. 1b. 2. 3. 4. 4a) — Monocotyledons, **F.**: *Aneilema vitiensis* (1a. 1b. 2. 3. 4. 5), **Dendrobium dimorphum* (rel.) (3), *D. hydrophilum var.* **morotaiense* (M.) (rel.) (4), *D. Mirbelianum* (3. 4), *D. quadrialatum* (M.) (4), **D. talaudense* (rel.) (3-4), *D. ternatense* (M.) (1a. 2-3), *Eria oligotricha* (3-4a. 4b), *Eulophia venosa* (3-4. 5a), **Microstylis purpureo-viridis* (rel.) (3-4), *Peristylus papuanus* (3-4a. 4b), *Sorghum laxiflorum* (2. 3-4. 5a); **P.**: *Alpinia pubiflora* (2. 3-4-4c), *Cladium philippinense* (2), *Dianella coerulea* (2. 3-4. 5. 5a), *Pandanus latissimus* (3-4a), *Pothos Rumphii* (1a. 2. 3. 4), *Riedelia curviflora* (3. 4. 5), *Themeda gigantea* (1a. 2. 3) — Dicotyledons, **F.**: *Adenia pandurata* (3-4), *Albizzia saponaria* (Indo China, 1a. 2. 3. 4), *Alphitonia sizyphoides* (1. 1a. 2. 3. 4a. 4. 5. 5a), *Amyema celebica* (1a. 2), *A. rigidiflora* (3-4), *Antirrhoea microphylla* (2), *Anthocephalus macrophyllus* (3. 4a), *Canthium prob. n. sp.* (rel.) (3), *Colona serratifolia* (M.) (1. 1a. 2-3), *Couthovia celebica* (1a. 2), **Dicymanthes hexameres* (M.) (rel.) (1a. 1b. 1c. 2-3), *Diospyros hebecarpa* (1a. 2. 3-4. 5. 5a), ***Discocalyx silvestris* (rel.) (1. 2. 3. 4. 5), *Dolicholobium prob. n. sp.* (rel.) (2. 3. 4. 5), *Endospermum formicarum* (M.) (4), *Eugenia panduriformis* (2), *Ficus Minahassae* (1a. 2), *Gynochthodes prob. n. sp.* (rel.) (2), ***Hemigraphis ceramensis* (3-4a), ***H. lanceolata* (1a. 2), ***H. Rumphii* (3. 4a), *Horsfieldia novo-guineensis* (3. 4), *Hydnophytum amboinense* (3), *H. inerme* (3-4), *H. philippinense* (M.) (2-3), *Iaera lanaensis* (2), *Ilex paucinervia* (2), *Ipomoea tiliacea* (trop. Amer., 3-4), ***Ixora talaudensis* (rel.) (1a. 2. 3), *Lepidagathis Robinsonii* (3-4a), *Lepiniopsis ternatensis* (1a. 2. 3), *Macaranga hispida* (1a. 2. 3. 4), *M. Mappa* (1a. 2. 3), ***Macropsychanthus dolichobotrys* (rel.) (2. 3-4-4c), *Maesa tetrandra* (Java, 3. 4), *Manilkara Merrilliana* (M.) (1a. 2-3), *Medinilla Teysmanni* (1a. 2. 3. 4?), *Morinda prob. n. sp.* (rel.) (China to Formosa, 1. 1a. 2), *Mussaenda philippica* (2. rel. 3), *Myrmecodia prob. n. sp.* (nr. 1) (rel.) (2. 3), *M. prob. n. sp.* (nr. 2) (M.) (rel.) (1a. 2-3), *Myrmephytum prob. n. sp.* (M.) (rel.) (1a. 2-3), *Myrtella Beccarii* (3-4), *Myxopyrum ovatum* (3-4a), *Nauclea mitragyna* (2. 3), *Ophiorrhiza prob. n. sp.* (nr. 1) (rel.) (2. 3), *O. prob. n. sp.* (nr. 2) (M.) (rel.) (2-3), *Ormosia calavensis* (1a. 2. 3), *Osmelia philippina* (M.) (2-3. 4), *Palaquium bataanense* (1a. 2), *P. luzoniense* (1a. 2), *Pimeleodendron amboinicum* (3. 4), *Piper villilimbum* (2-3. 4a), *Psychotria leptothyrsa* (2. 3), *P. prob. n. sp.* (nr. 1) (rel.) (2), *P. prob. n. sp.* (nr. 3) (M.) (rel.) (2-3), *Pueraria pulcherrima* (1a. 2), *Rapanea densiflora* (3-4a. 4b), *Scaevola micrantha* (2), *Sterculia ceramica* (1a. 2. 3), *S. comosa* (1a. 2. 3-4a), *S. Treubii* (3-4a), *Styphelia moluccana* (3. 4a), *Terminalia Copelandii* (2), *Trichospermum eriopodum* (2), *Uncaria longiflora* (2. 3), *U. setiloba* (M.) (rel.) (2-3), *U. prob. n. sp.* (rel.) (2. 3), *Vatica papuana* (M.) (1. 2-3. 4), *Vernonia lanceolata* (3. 4); **P.**: *Antidesma Cumingii* (2), *Artocarpus communis* (3-4. 5) (E., T.), *Blumeodendron paucinervium* (2), *Boerlageodendron barbatum* (3-4a), *B. serratifolium* (2), *Celtis latifolia* (M.) (4. 4b), *Cleistanthus megacarpus* (M.) (1.

2-3), *Cyathocalyx acuminatus* (2), *Cyclostemon littoralis* (2), *Cyrtandra capitellata* (3), *C. pallida* (M.) (2-3), *Dalbergia ferruginea* (1. 2. 3-4-4c), *Decaspermum Blancoi* (2), *Dischidia Copelandii* (2), *Dracontomelum dao* (1a-2. 3), *Elaeocarpus dolichostylus* (3-4), *E. gigantifolius* (M.) (2-3), *E. multiflorus* (1a. 2), *Eugenia acutangula* (M.) (4a. 4b), *E. calubcob* (2), *E. Everettii* (2), *Fagraea ternatana* (3), *Ficus Cassidyana* (M.) (3), *F. heteropoda* (1a. 2. 3), *F. rudis* (1a. 2. 3), *Garcinia rhizophoroides* (2), *G. tetrandra* (1a. 2), *Gironniera celtidifolia* (M.) (2. 3. 4. 5), *Gyrinopsis Cumingiana* (M.) (1a. 2. 3), *Hoya sussuela* (3-4a), *Iodes philippinensis* (1. 2), *Koordersiodendron pinnatum* (1. 1a. 2. 3. 4), ***Desmofischera monosperma* (2), *Litsea Perrottetii* (1a. 2. 3), *Melicope triphylla* (2), *Schefflera ovoidea* (2), *Schuurmansia Theophrasta* (3. 4), *Strombosia philippinensis* (2), *Tylophora Perrottetiana* (2), *Vaccinum Vidalii* (2), *Vavaea amicorum* (2. 3-4..5).

A simple calculation from the above-mentioned data show that the groups VI. B, VII. B, VII. C and VII. D comprise 5, 23, 8 and 148 species respectively, which may be considered directly evidential for the phytogeography of Talaud and (or) Morotai. In addition, there are 20 species with "incomplete" areas, mentioned under VII. B, parts of which have not been considered among the 23 just quoted, making a total of 204 species. *Table III* displays the phytogeographical relations indicated by these 204 species, in which final and provisional identifications have always been distinguished, although there is little reason to fear that the latter are, on the whole, much less trustworthy than the former.

In Column I of Table III the areas represented in the collection are enumerated by means of their symbols, used in the scheme on p. 122.

Column II shows the numbers of species which exclusively cover the single areas. For instance, the area Talaud-Philippines (nr. 3, symbol: 2) is known for 26 species, viz. 10 "finals" and 16 "provisionals"; the area Philippines-Talaud-Northern Moluccas (nr. 27, symbol: 2, 3) is shown by 17 species, viz. 15 final, of which 3 have been collected in Morotai only, and 2 provisional, both from Morotai.

Column III gives the numbers of species, the areas of which include one of the 46 connections or combinations of connections in such a way that they may be considered of importance for the phytogeography of the islands in question.

In Column IV the figures of the two preceding columns have been added, giving a total of 184 species (of which 38 from Morotai only), viz. 128 finals (28 from Morotai only) and 56 provisionals (10 Morotai).

Column V, finally, shows the frequency of any of the connections and combinations of connections in all areas, separately calculated for Talaud or for both Talaud and Morotai, and for Morotai only. These figures result from a simple addition of the numbers of species in whose area a given connection occurs. For instance, connection nr. 11 (symbol: 1, 2) occurs (cf. Column IV) in the nrs. 11 (2 species from Talaud), 13 (2 species from Morotai), 15 (2 species from Morotai), 17 (2 species from Talaud), 21 (1 species from Talaud), 23 (2 species from Talaud), 24 (1 species from Morotai), 25 (1 species from Talaud) and 26 (1 species from Talaud), the total frequency of the connection 1, 2 being, therefore, 9 in areas of species collected in Talaud or both in Talaud and Morotai

TABLE III.

Survey of species and areas of direct significance for the phytogeography of Talaud and (or) Morotai.

Nr.	I	II			III			IV			V					
	Position of connection	This connection only (group VII. D)			Connection as an essential part of a larger area (groups VI. B, VII. B, VII. C)			Totals of the columns II and III			Frequency of the connections in all areas 2)					
											Talaud or Tal. + Morotai			Morotai only		
	Connection / Identification	Final	Prov.	Total	Final	Prov.	Total	Final	Prov.	Total	Final	Prov.	Total	Final	Prov.	Total
1	1	—	—	—	—	—	—	—	—	—	6	3	9	4	1	5
2	1a	—	—	—	—	—	—	—	—	—	20	9	29	5	1	6
3	2	10	16	26	1	—	1	11	16	27	55	30	85	12	5	17
4	3	5 (1)	4 (1)	9 (2)	5	4	9	10 (1)	8 (1)	18 (2)	77	27	104	13	6	19
5	4	(3)	—	(3)	—	—	—	(3)	—	(3)	37	11	48	6	2	8
6	4a	—	—	—	(6)	(2)	(8)	(6)	(2)	(8)	19	4	23	7	3	10
7	4c	—	—	—	—	—	—	—	—	—	1	2	3	—	—	—
8	4d	—	—	—	(4)	—	(4)	(4)	—	(4)	—	—	—	—	4	4
9	5	—	—	—	—	—	—	—	—	—	12	4	16	—	1	1
10	5a	—	—	—	—	—	—	—	—	—	8	1	9	—	—	—
11	1, 2	—	1	1	1	—	1	1	1	2	6	3	9	4	1	5
12	1a, 2	8	2	10	—	—	—	8	2	10	23	9	32	5	1	6
13	1, 2, 3	(1)	(1)	(2)	—	—	—	(1)	(1)	(2)	3	2	5	4	1	5
14	1a, 2, 3	9 (4)	6 (1)	15 (5)	—	—	—	9 (4)	6 (1)	15 (5)	13	7	20	5	1	6
15	1, 2, 3, 4	(2)	—	(2)	—	—	—	(2)	—	(2)	3	2	5	2	—	2
16	1a, 2, 3, 4	3	1	4	—	—	—	3	1	4	8	2	10	—	—	—
17	1, 2, 3, 4, 5	2	—	2	—	—	—	2	—	2	3	—	3	—	—	—
18	1a, 2, 3, 4, 5	1	—	1	—	—	—	1	—	1	3	—	3	—	—	—
19	1a, 2, 3, 4a	1	—	1	—	—	—	1	—	1	3	—	3	—	—	—
20	1a, 2, 3, 4, 4a	1	—	1	—	—	—	1	—	1	2	—	2	—	—	—
21	1, 2, 3, 4, 4c	—	1	1	—	—	—	—	1	1	—	1	1	—	—	—
22	1a, 2, 3, 4, 5, 5a	1	—	1	—	—	—	1	—	1	2	—	2	—	—	—
23	1, 1a, 2	2	—	2	—	—	—	2	—	2	3	1	4	1	—	1
24	1, 1a, 2, 3	(1)	—	(1)	—	—	—	(1)	—	(1)	1	1	2	1	—	1
25	1, 1a, 2, 3, 4	—	1	1	—	—	—	—	1	1	—	1	1	—	—	—
26	1, 1a, 2, 3, 4, 4a, 5, 5a	1	—	1	—	—	—	1	—	1	1	—	1	—	—	—
27	2, 3	15 (3)	(2)	17 (5)	—	—	—	15 (3)	(2)	17 (5)	34	11	45	13	5	18
28	2, 3, 4	(1)	—	(1)	1	—	1	2 (1)	—	2 (1)	15	6	21	3	1	4
29	2, 3, 4, 5	3	2 (1)	5 (1)	—	—	—	3	2 (1)	5 (1)	8	2	10	—	1	1
30	2, 3, 4, 5a	1	—	1	—	—	—	1	—	1	3	1	4	—	—	—
31	2, 3, 4, 5, 5a	—	1	1	—	—	—	—	1	1	2	1	3	—	—	—
32	2, 3, 4a	2 (1)	—	2 (1)	—	—	—	2 (1)	—	2 (1)	3	—	3	1	—	1
33	2, 3, 4, 4c	1	1	2	—	—	—	1	1	2	1	2	3	—	—	—
34	3, 4	15	1	16	—	2	2	15	3	18	36	11	47	3	1	4
35	3, 4a	7	3	10	4	1	5	11	4	15	19	4	23	—	—	—
36	3, 4, 4a	—	—	—	1	—	1	1	—	1	3	—	3	—	—	—
37	3, 4, 5	—	2	2	1	—	1	1	2	3	11	4	15	—	1	1
38	3, 4, 5a	1	—	1	1	—	1	2	—	2	7	1	8	—	—	—
39	3, 4, 5, 5a	—	—	—	2	—	2	2	—	2	4	1	5	—	—	—
40	3, 4a, 4b	3	—	3	—	—	—	3	—	3	3	—	3	—	—	—
41	4, 4b	—	(1)	(1)	—	—	—	—	(1)	(1)	—	—	—	—	1	1
42	4a, 4b	(1)	(1)	(2)	—	—	—	(1)	(1)	(2)	3	—	3	1	1	2
	Totals	101 (18)	47 (8)	148 (26)	27 (10)	9 (2)	36 (12)	128 (28)	56 (10)	184 (38)						
43	CT 1)	7	8	15	—	—	—	7	8	15						
44	CT + 1)	—	—	—	2	—	2	2	—	2						
45	BCT 1)	1	1	2	—	—	—	1	1	2						
46	BT 1)	1	—	1	—	—	—	1	—	1						
	Grand Total	110 (18)	56 (8)	166 (26)	29 (10)	9 (2)	38 (12)	139 (28)	65 (10)	204 (38)						

( ) Morotai only.

1) "Incomplete" areas of group VII B, as far as not considered in column II.

2) "Incomplete" areas excepted.

For explanation see text (pp. 124—125).

(6 finals and 3 provisionals), and 5 in areas of species collected in Morotai only (4 finals, 1 provisional).

Mainly two questions may be put forward in regard to the phytogeographical relations of the islands under consideration, viz. which areas are prevalent, and which floristic element prevails in the florae of Talaud and of Morotai?

Talaud.

As by far the greater part of the collection was made in this region, it is self-evident that the areas in which the connections 2 and 3 occur, are in the majority. These are the areas nrs. 3, 4 and 11—40. Of these the areas nrs. 3, 4, 12, 14, 27, 34, 35 and CT comprise each 10 or more species. It is certainly remarkable that the area:

Nr. 3, Talaud-Philippines, is found in as many as 27 out of 166 species, collected in Talaud. Next come the areas:
Nr. 34, Talaud-Northern Moluccas-New Guinea, with 18 species,
Nr. 4, Talaud-Northern Moluccas, with 16 species,
Nr. 35, Talaud-Northern and Southern Moluccas, with 15 species,
Nr. CT, Talaud-Celebes, with 15 species,
Nr. 27, Philippines-Talaud-Northern Moluccas, with 12 species,
Nr. 14, Celebes-Philippines-Talaud-Northern Moluccas, with 10 species, and
Nr. 12, Celebes-Philippines-Talaud, with 10 species,

making a total of 123 out of 166 species, whose areas cover a part of the narrow migration track from Celebes to New Guinea through the Philippines or at any rate through Talaud and the Moluccas.

As far as the frequencies of the connections are concerned, it is shown in Column V that in Talaud-species connection nr. 4 is prevailing, which points to a strong connection with the Northern Moluccas. However, connection nr. 2 (Talaud-Philippines) is a good second. The relatively high frequencies of the connections with New Guinea (nr. 5), with the Southern Moluccas (nr. 6) and with Polynesia (nr. 9) again point to a strong eastern relation of the Talaud flora, which is supported by the combinations nrs. 34, 35 and 37. It hardly needs further comment that connection nr. 2 and the combinations nrs. 27, 12, 28 and 14 are also fairly well represented.

Regarding the 35 species of group VII. B that are unknown from the Philippines (cf. p. 121), the possibility of a direct connection between Celebes and Talaud cannot be ignored from a merely phytogeographical point of view, as long as these species have not been detected in the Philippines. Such a connection cannot be confirmed by geological evidence but, although an indication of this kind should not be overestimated, it may be pointed out that the submarine Talaud geanticline (cf. *Fig. 2*) is running very close to the east-coast of North Celebes. In view of general principles concerning the phytogeographical relations of these parts (cf. Lam, l. c., 1938), only 1 out of these 35 species is evidently "improbable", viz. *Lygodium borneense*, which is only known from Borneo and from Talaud; 2 others, known from Borneo, Celebes and Talaud, might also be improbable, but of the remaining 32 (Celebes-Talaud, and Celebes-Talaud-

Moluccas) such an improbability cannot be stated on account of any definite evidence.

Proceeding to our second question concerning the prevailing floristic element, we may refer again to Table II, from which it appears that 524 of the Talaud species have been identified. Of these, the groups I—IV with 171 species altogether may be left out of consideration, although it may be safely assumed that many species of the groups III and IV have to be regarded representatives of the western element, relative to the Talaud flora. Irrelevant are further 71 species of group VII. A, 2 of VII. B which have not been considered in Table III, and 25 species from Table III belonging to the area-groups nrs. 16—22 and 25—27, which extend as much in one direction from Talaud as a centre as in the other.

Of the remaining 254 species 169 are representing the western element, viz.

of group V: 72 species (of which 13 W.),

of group VII. A: 26 species (all W.), and

of Table III: 71 species (nrs. 3, 11, 12, 14, 23, CT, CT +, BCT and BT).

The eastern element is represented by 85 species, viz.

of group VI. A: 14 species,

of group VI .B: 1 species (E.) which has not been considered in Table III, and

of Table III: 70 species (nrs. 4 and 28—40).

Even if the groups III and IV are left out, the result is that, as might have been expected, the western element in the Talaud flora is much stronger than the eastern one.

Morotai.

In view of the very small number of species collected in Morotai only, nothing definite can be said regarding the phytogeographical relations of this island. As far as can be stated from the figures in Table III (Column IV), the inter-Moluccan relations (nr. 6) and the relations with New Guinea (nrs. 5, 41 and 42) seem to be fairly strong, viz. 14 out of 36 species. On the other hand, 21 species have more western areas (nrs. 4, 8, 13, 14, 15, 24, 27 and 28).

As appears from Table II, 87 species have been identified from the Morotai material. Of these, 9 species of groups II—IV, 13 of group VII. A, 6 of group VII. B, 3 of group VII. C which have not been considered in Table III, and 9 of Table III (nrs. 6 and 29), are of no importance for the phytogeography of the island. Of the remaining 47 species, 39 represent the western element, viz.

of group V: 10 species (of which 1 W.),

of group VII. A: 8 species (all W.), and

of Table III: 21 species (nrs. 8, 13—15, 24, 27, 28 and 32).

The eastern element is represented by only 8 species, all of which are considered in Table III (nrs. 4, 5, 41 and 42). Therefore, as far as can be concluded from our poor data, also in Morotai the western element is strongly prevailing.

6. PRODUCTS.

It does not lie within the scope of the present paper to deal at some length with the economic side of the flora of Talaud and Morotai. As far as Talaud is concerned, we may, therefore, refer to the paper by Tergast on the agriculture and to that by Heringa on the timbers. Regarding Morotai, the information collected by us was too scanty to deserve special mention. General information may be found in Baretta's report on Halmahera and Morotai.

Yet, a few words may be added here in regard to the timbers of Talaud. In his paper, Heringa mentions native names only. As these are fairly constant and trustworthy as far as the well-known and valuable timbers are concerned, our list of native names and their latin equivalents (§ 7) may be of some use. Probably most, if not all of the names mentioned by Heringa were noted from information given by native experts, not actually controlled in the forest. Of these only the following are not mentioned in or do not agree with our list:

Heringa, l. c. p. 744:

Gofasa batoe = *malalao.* According to H. this should be *Lagerstroemia ovalifolia* T. & B., a species not collected by me (cf. De Clercq-Pulle, Nieuw Plantk. Woordenboek v. Ned.-Indië, 1927, n. 2330). Perhaps the native name *malalao* stands for *malalá'a* = *maralá'a* = *Pimeleodendron amboinicum*?

Sarotta. According to H. this should be *Vitex celebica* Koord. (*V. heterophylla* Roxb.), which I did not collect. The tree, collected by me under the name *saròtah*, was a *Terminalia.*

Pengoeana. Probably the same as our *pongóéan'a (Elmerrillia ovalis).*

Heringa, l. c. p. 745:

Balasa, not in our list.

Awoenboela, not in our list.

Ramoe. Possibly the same as our (*áloe*) *rámoet'a* (*Cleistanthus myrianthus*)?

Apala, not in our list; cf. our *ampawa*?

On p. 746 Heringa says that ebony (*batoelíneh*) does not occur in Nenoesa. *Diospyros Rumphii* was, however, shown to me in Merampi.

In Garete, the forest reserve of the Nenoesa Islands, the following species were particularly pointed out to produce timber for proa construction: *ampáwa* (*Ochrosia oppositifolia*), *anggirían'a* (*Palaquium bataanense*), *antoála* (*Elaeocarpus* spec.), *asàŝoe* (*Chisocheton* spec., n. 3204), *bitáwak'a* (*Calophyllum soulattri*), *laládon* (*Planchonella obovata*), *maíleh* (*Eugenia ? fastigiata*), *nátoh* (*Palaquium obtusifolium*), *tamaríseh* (*Terminalia* spec.; n. 3167). In Merampi, *nanítoe* (*Rhus rufa*) is also used for proa construction.

In Miangas, practically the only timber tree is *nátoh* (*Palaquium obtusifolium*), and it may be readily assumed that all specimens growing there, have been intentionally planted. For the rest, all timber is imported from elsewhere, particularly from Nenoesa, and for want of timber most of the houses are constructed of the stems of coconut trees.

7. LANGUAGES AND NATIVE NAMES.

The Talaud language belongs to the group of Philippine languages, in which also the tongues of Sangihe and of the Minahasa (N. Celebes) are inserted. This is apparent also in several plant names, as will be seen on comparison of the list given underneath with the native names given by Merrill (Enum. Phil. Flow. Plants).

The following remarks claim no philological value whatsoever. Therefore, for the phonetical spelling the Dutch language has been chosen as a basis in order to facilitate the use of the plant names and their comparison with those given in other publications, particularly on behalf of forestry purposes. Accordingly, the following directions should be consulted before reading this paragraph:

The stress, as far as known to me, has been marked by an accent, ´ on open vowels and on vowels in closed syllables (e. g. *ampáwa,* and *ángkang’a*), ` on dull-toned vowels, indicating a phonetical doubling of the following consonant (e. g. *asàsoe, aròsoh, pèlèta*).

a = always open (more or less as in banana), never like the English a
i in open syllables = a short ee
j = y in year
ng = one consonant (*a-oe-mà-ngan’a*)
ngg = ng + g (*a-ríng-ga*)
oe = u in true; the stress has, therefore, been indicated by a double accent (óé).

There are no diphthongs. Consecutive vowels always represent as many syllables (except, of course, in the case of oe which acts as one single vowel), e. g. *sam-pa-roe-á-i, mò-o-ng’a, ma-í-leh.*

The terminal consonant is often vocalized by an almost mute 'a. The l and the r are in many cases pronounced in almost the same way. This implies that in many names l and r may replace each other. Other sets of substituting consonants are b — p, b — w, d — l — r, m — b, k — t, etc. Examples are (plant names unless indicated otherwise):

bamboelóéda — *pampoeróéda, babíne* — *wawíne* (female), *dandíla* — *landíla* — *randíla, mariwoeàn’a* — *bariwoeàn’a, bínsak’a* — *bínsat’a.*

Particularly the last-named substitution is dialectic. According to Talens there are some six or eight dialects in the Talaud group, differing i. a. in the terminating consonant and in the terminal 'a, e. g.

	coconut	male
Sal., W. and S. Kab.	*nióéka*	*ésaka*
S. Karak., N. Kab.	*nióétja*	*ésatja*
C. Karakelong	*nióéta*	*ésata*
W. Karakelong	*nióéra*	*ésara*
Kaboeroeang	*nióéha*	*ésaha*
N. Kar., Nen., Miangas	*níoe*	*ésah (ésa’)*

In the last-named dialect the ultimate syllable is substituted by a hamzah (light guttural g or h).

Among the plant names enumerated below numerous examples of these rules may be found.

Sometimes a similar substitution is found in the middle or in the beginning of a name, e.g. *atsoeára — sansoeára, síkat'a — sírak'a, arangíjoh — sangíjoh.*

In other cases we may speak of a metathesis, such as *alabóé'oe — la'abóé'oe, larià̀san — laransián, sa'ansáwa — sasáwa'a.*

The following list may give some idea of the variations found in the same name:

aléwat'a — aléwak'a
aloebàtoe — aloewàtoe
amaloeàn'a — loeàn'a
aníta — ánih
arámpoe — aràpoe
aròsoh — araròsoh
banangíran'a — dalangíran'a — lalangíran'a
bíndoek'a — bíndoe
boelít'a — boerít'a
dalíta — laíta — laríta
daróénoe — laróénoe — natóénoe
déisah — ráisah — deh
iáma — kiáma
kanoembóélan'a — panimbóéran'a
laládon — lolòtan
laransiàn'a — lariasàn'a
lariángoh — dariángoh
maratálam'a — maratálang'a
nàki — nàti — nári — nátji — màti
papíri — rapíri
samparoeái — tamparoeáoe
tamalísa — tamaríseh — salíseh.

In compound names the genetive is expressed by *oe* (of) after a closed syllable, e.g. *óéwak'oe piápi* (*óéwak* of Mt. Piapi), by *'m* or *'n* after an open one, e.g. *lèo'mbáwi* (*lèo* of the pigs), by *k* after a *ng* and before a vowel, e.g. *daràmang'kahoerángan* (*daràmang* of the forest).

The native names of plants were taken from native experts. Usually only few people among the population of a village are particularly familiar with the local plants, their names and their use. Before starting any collecting trip, my first care was, therefore, to ask for a reliable and trustworthy expert who was willing to accompany me and give me his continuous advice. In the localities 1 and 2, where I collected my first knowledge of the Talaud flora and in which I spent almost a month, I was so lucky as to come into touch with an elderly man, named Zakeos, from Beo, who proved to be thoroughly familiar with the Talaud flora and whose perfect seriousness was a guarantee for the reliability of his information, on the basis of which I was able to appreciate that, given by the experts in the other islands. Yet, I deemed it necessary to check, recheck and countercheck this information repeatedly, as it is a well-known fact that a white man, not familiar with the native tongue, may make a fool of himself by jotting down as native names the equivalents of such non-committal descriptions as: "big tree", "climber", "plant with red flowers", not to speak of suspicious jokes or of such colloquialisms as: "I don't know", or even: "that's none of your business!" I am not sure that I have entirely avoided the last-named category, e. g. *ára'ápa* for some terrestrial ferns seems somewhat suspect, as *apa* means "which" or "what", and perhaps *amaloeàn'a* for *Champereia manillana* is not genuine either, since *a'aloeàn'a* means "some tree" (*áloe* = tree or timber). But it is quite obvious that some of the names given to me are belonging to the first-named category: *a'áloem bíran'a* and *ápoet'oe aroembíran'a,* for instance, names given to several lianas, probably mean nothing else but climbing or twining plant and *wáring garàtoe* for *Myrmecodia* means only house of ants. It is probable that there are a number of other names of which the non-specific nature was not detected, for concerning the Talaud language I am a stranger in Jerusalem. Without any philological training I had to work with some few words picked up during my stay in Talaud and for the rest I had to relay on the papers by Talens-Adriani and by Steller which are not easy to handle by a layman, who is not able to appreciate the value of the numerous prefixes, infixes, suffixes and reduplications and the many ways of composed words in which the Talaud language is so rich. This is the more so, since no vocabularies have been published but the two, quoted by Talens (l. c., p. 2) and thoroughly disapproved by Steller (l. c., p. 2—3), and a third, not quoted by either of these authors, viz. A. J. F. Jansen, Vergelijkende Woordenlijst van de talen en de dialecten in de Residentie Menado (Tijdschr. Ind. Taal-, Land- en Volkenk., N. S. I., 1855, 521—548) in which 146 Talaud words are given, the scientific value of which I cannot estimate.

Consequently, the significance of a great number of names was inaccessable to me and of some others it was difficult to appreciate the real value. In view of what has been said above, the specific value is, for instance, somewhat suspect in names alluding to some demon (*paliàn'a*) such as *bóésa'oe palián* (banana of devil) for *Dendrobium* with banana-like pseudobulbs, *áloe'mpaliáng* (devil's weed) for *Begonia* species and *títoe oe palián* (*títoe* = ?) for a palm. These names may be genuine as well as a successful attempt of pulling the leg of that silly Westerner with his unquenchable thirst of information. Next to the demons, the pigs (*bàbi* or *wáwi*) may be suspected to act as a "deus ex machina". The following names may be or may be not genuine: *binóénga'mbàbi* (when asked, it was asserted that this tree, *Croton argyratus*, should thrive on boars' excrements), *lèo'mbáwi* (*Dracontomelum*), *saráwat'oe wáwi* (*Dioscorea*), *ambóéroenga'mbàbi* (*Scoparia*), *láa'mbàbi* (*Jussieua*). Some other animals occur also in the names, e. g. *dandíla mèoh* (*dandíla* = tongue, *mèoh* = cat), *tolenàsoe* (*tóleh* = tail, *àsoe* = dog), *larasiàn'oe paní'i* (figs eaten by *paní'i* or *paníki* = bats or flying foxes), *nàki'mbaráwo* (*nàki* = Canarium, *baráwo* = mouse), *nàki'mpóéneh* (*póéneh* = a bird), *ánoe óése'a* (*óése'a* = the cuscus, *Phalanger maculatus,* said to occur only in Salebaboe, not in the other Talaud Islands), *áring kámbing* (*kambing* = goat), *tengtaramiseán* (trees or shrubs the fruits of which are eaten by small birds called *salamisi*) and *óéta oe oedároh* (= hair of horse) for the horse hair blight. Most of the last-mentioned names seem quite acceptable, since all languages have similar vernacular names.

Next to these the following words were obvious.

Ésat'a (male) and *wawíne* (female) are often used in addition to another name. These names have, of course, nothing in common with our interpretation relative to sex. They are found in numerous vernaculars even in Europe as is still apparent in such botanical names as *Dryopteris Filix-mas* and *Athyrium Filix-femina.* Basing himself on his native informants Rumphius makes an extensive use of these conceptions, the signification of which seems to be pretty variable. The distinction sometimes applies to a difference in habit, hairiness, spines or no spines, within the same Linnean species, e. g. *lalónda ésat'a* (spiny) and *l. wawíne* (a very courteous name for the spineless form of *Acanthus ilicifolius*). In this and in other cases, the relation is accepted by official botany, but the first name includes a larger group than the species, e. g. *nanàsi ésat'a* (*Rhizophora mucronata*, but also *Bruguiera conjugata*?), and *n. wawíne* (*Bruguiera conjugata*). However, the name *nanàsi* is also given both to the pineapple and to *Gahnia aspera*! In the last-named case there is no systematic relation whatsoever, and the same may be said, for instance, relative to the name *tengtaramiseán* (*Astronia* and *Maesa*), *t. ésak'a (Melastoma)*, *t. wawíne* (*Deeringia* and *Saurauia*), which is perhaps due to the fact that the first name means: fruits eaten by the *salamisi* bird.

Another set of additions often met with is *oeróéne* (*oelóéne*) and *(m)ahoerángan.* According to Talens (l. c., p. 11) the last-named word, meaning forest, should be derived from a Sangihe word meaning old. Its actual signification, however, is secondary forest, in contradiction to *oeróéne*, which, properly speaking, means the interior, which i. e. stands for primaeval forest. In many cases the addition of either *oeróéne* (e. g. *goeràla'a oeróéne*) or *ahoerángan* (e. g. *sòsop ahoerángan*) may be noncommittal, in some others it may be, that of two related species one is characteristic for the primary, the other for the secondary forest but of this no unequivocal examples came to my knowledge. In *Hernandia ovigera*, *oeróéne* evidently means interior, in contradistinction to the common coastal species *Hernandia peltata* Meissn.

Still another distinction is made by the addition *bátoe* (rock) or *bówo'mbátoe* (*bowóne* or *wowóne* = mountain), so as to indicate that the species in question is preferably growing on rocky soil, e. g. *bitáwak bátoe* (*bitáwak* = *Calophyllum soulattri*, *b. batoe* = *Planchonella firma*; the relation between these two constant names is not clear) and *aráboe wówo'mbátoe* for *Pteris vittata.*

It is not surprising that the quite unusual flora of Mt. Piapi has been puzzling the natives. There are several plants, which are given the epitheton *oe piápi* or *'mpiápi*, e. g. *óéwak'oe piápi* (*óéwak* = *Flagellaria*) for a *Dendrobium* and *ámi'mpiápi* (*ámih* = rice; the name is given to *Themeda gigantea*). In the latter case there is at least some relation, but in the former the allusion to *Flagellaria* is quite obscure. In other cases the relation is equally indistinct. When asked for the name of a plant which is of no use to the natives, the reply is often the name of a well-known plant with which it shows a faint resemblance, actually or in the mind of the informant, e. g. *peràpat'a* for *Wikstroemia indica* (Mt. Piapi) as well as for *Sonneratia caseolaris* (sea-shore). It has been suggested that the name of Mt. Piapi should be derived from this plant (*Wikstroemia*), since another name both for *Wikstroemia* and for *Sonneratia* (and other mangrove trees such as *Avicennia*) is *api-api* (*api* [Malay] = fire; the wood of these trees is demanded for fire-wood). An exception to these incongruities is the name *panimbóéran'a* which is given both to the common sea-shore shrub *Scaevola frutescens* and to the related but quite different Piapi shrub *Sc. micrantha.*

Finally, I came across the following significations:

áloe('m)ítoem'a (*Diospyros hebecarpa*) from *áloe* = wood and *maítoem'a* = black.

bamboelóéda (*bamboeróéda, pampoeróéda, pampóéloe, pampoelóéta, pampoeróéda*), according to Steller (l. c., p. 10) a tree with much "*poeloe*" = a sticky juice, i. e. the milky juice. The name is given both to *Alstonia scholaris* and to *Euphorbia Atoto* and *E. serrulata.* However, the name of *bambalóéda* was given to *Timonius celebicus*, a tree which does not possess milky juice. It is possible that in this case the name alludes to the pubescence of the young leaves and of the flowers (*bamboeloe* = hairs).

marimbòsa; according to Steller (l. c., p. 36), this is a tree, resembling *Citrus* (*bòsa*). Of the three plants occurring in our list, the name is probably particularly applicable to the two Rutaceae (*Micromelum* and *Zanthoxylum*), but *Ximenia* also resembles *Citrus* by its strong axillary thorns.

nanίoe, a Nenoesa name given to *Spathoglottis plicata* (in addition to the name *sasáwa'a*, given to several terrestrial orchids) because of the leaves which should resemble those of the coconut palm (*níoe*).

padóé'oet oe papóéa (*Oldenlandia pterita*), said to signify weed of a hole or pit in the ground.

radóé'oet oe manáro (*Ageratum conyzoides*); *radóé'oet* = *padóé'oet* = weed, of Manado. My native informant told me that this adventitious plant should have been introduced, apparently from Manado, in about 1890.

There are a number of other names, the significance of which might be guessed, but with my very poor knowledge of the language it seems unwise to make any suggestions concerning these.

Concerning the specificity, constancy and reliability of the native names, I may add that these are the greater, as more useful plants are considered. The same may be stated in other native tongues and the phenomenon is self-evident. Accordingly, the names of trees and also of several common herbs are often very constant and reliable though, of course, they do not always cover the same "taxon" as a white botanist sees it.

Among the lianas, climbers, herbs and epiphytes the non-committal and group names are already more numerous, but plants which are particularly conspicuous from some point of view (taste, smell or medical use) are often specifically named. Of all groups, the epiphytes, already poorly represented in Talaud, are most poorly known to the natives.

List of Talaud plant-names.

In this list the following abbreviations have been used: H. name, mentioned by Heringa, l. c.; K. West Karakelong (Loc. 1 and 2); Kb. Kaboeroeang (Loc. 4 and 5); M. Miangas (Loc. 9); N. Nenoesa (Loc. 10 and 11); P. Mt. Piapi (Loc. 7 and 8); S. Salebaboe (Loc. 3 and 6); St. name, mentioned by Steller, l. c.

For the pronunciation see p. 128.

I. Trees and Shrubs.

An * asterisk denotes that this tree was indicated as yielding a valuable timber, mostly for house but also for proa construction; a double ** asterisk or a *** triple one indicates the most demanded (house and) proa timbers.

a'asíli (K.) — Couthovia celebica
abá('a) (K., P.) — Rauwolfia amsoniifolia; also (but erroneously?) for Lepiniopsis ternatensis (K.); see also awá'a
ababá'a (K.) — Pandanus latissimus
*abambáng'a (K., Kb.) — Litsea Forstenii
abólo'a (K.) — Pittosporum ferrugineum
abólo'a (K., N.) — Geniostoma celebicum
alabóé'oe } (N.), see la'abóé'oe
alawóé'oe }
aladóng'a (K., P., S.) — Eugenia panduriformis
aléwak'a (S.) } — Eugenia saligna; also (but erroneously?) for Planchonella
aléwat'a (K.) } firma (K.)
alóéba (P., S., Kb., N.) — Pimeleodendron amboinicum
aloebàtoe (N.), see aloewàtoe
aloelá'a (P.) — Vaccinium Vidalii
áloe('m)ítoem'a (S., N.) — Diospyros hebecarpa
áloe rámoet'a (K.) — Cleistanthus myrianthus
aloewàtoe (M.) — Triphasia trifolia
„ (S.) — Blumeodendron paucinervium
amaloeàn'a (S.) — Champereia manillana
ambíra (K.) — Ficus rudis (also Villebrunea rubescens?)
améad'a (K.) — Pimeleodendron amboinicum
***amiséan(g)'a (K., S., Kb.) — Mezzettia spec. (n. 2898)
amiséan'a batoe (K.) — Mitrephora spec. (n. 2582), Polyalthia celebica
amómas'a (K., S.) — Sterculia Treubii
ampáwa (N.) — Ochrosia oppositifolia
anàman (N.) — Pandanus spec. (not collected)
andaliára (M.) — Clerodendrum Buchanani
andénak'a (Kb.) — Kleinhovia hospita
anggaliára (N.), see sub IV.
*anggirían'a (N.) — Palaquium bataanense
anggóésip'a (K., P.) — Antidesma spec. (n. 2785), Baccaurea javanica, B. spec. (n. 2657)
ángkang'a (K.) — Schefflera ?confinis
angkaráha (M.) — Colubrina asiatica
ánih (N.) } — Colona scabra
anít'a (K., S.) }
anóéwoek'a (K.) } — Gomphandra javanica
anóéwoet'a (K.) }
ansarángi (S.) — Dolichandrone spathacea
ansoeára (M.), see sánsoearàn'a
antáloet'a (K.) — Nauclea mitragyna
antamát'a (S., N.) — Elaeocarpus spec. (n. 3120)
„ (N.) — Vavaea amicorum
antoála (K., S., Kb., N.) — Elaeocarpus dolichostylus, E. multiflorus
antóéwoe (N.) — Claoxylon longifolium, Cyathocalyx ?acuminatus

aramáloe (N.) — Champereia manillana
arambáhi (N.) — Planchonella nitida
arámpoe (N.) — Allophylus Cobbe
arangíjoh (K.), see sangíjoh
aràpoe (N., M.), see arámpoe
araríntok’a (Kb.) — Allophylus Cobbe
**araróéra (N.) — Guettarda speciosa
araròsoh (N.) — Pimeleodendron amboinicum
arínggа (K.) — Cinnamomum spec. (n. 2903)
arisóésoe oeróéne (K.) — Schuurmansia Theophrasta
arombáhi, see arambáhi
aròsoh (P., M.), see araròsoh
asimbóéroeng’a (Kb.) — Ficus ampelas
asàsoe (Kb.) — ?Chisocheton spec. (n. 3204)
atántas’a (S.) (cf. same name sub II) — Ficus celebica
atóéwoet’a (K.) — Cyathocalyx ?acuminatus
atomòning’a (K.) — Alsophila Fenicis
atsoeára (M.)
atsoearàn’a (N.) }, see sánsoearàn’a
aoemánga(n’a) (S., Kb., N.) — Alchornea rugosa
**awá’a (K., S.) — Anthocephalus macrophyllus, Artocarpus elastica; see also abá’a
*ba’ánah (K.) — Litsea Perrottetii
*ba’aròsa (S.) — Rauwolfia javanica
bábah (N.), see ababá’a
**báloek’a (S., Kb.) — Pterospermum celebicum
bambak’a (K.)
bambat’a (K.) } — Melochia umbellata
*bambalóéda (K., Kb.) — Timonius celebicus
bamboelóéda (K., S.)
bamboeróéda } — Alstonia scholaris
bánah (M.) — Antidesma celebicum
„ (K., Kb.) — Glochidion zeylanicum, var. malayanum
banangíran’a (N.), see lalangíran’a
barabíran’a (K., S.) — Leucosyke capitellata
barámbang’a (K., Kb., N.) — Eugenia ?fastigiata
bároe (K., S., M.) — Hibiscus tiliaceus
batoelíneh (Kb., N.) — Diospyros Rumphii
biàk’a (K.)
biàt’a (K.) } — Alangium spec. (n. 2854)
bináwin’a (K., P., S.) — Endospermum spec. (n. 2873), Macaranga Mappa, M. spec. (ns. 2859, 2894)
bíndoe(k’a) (N.) — Tournefortia argentea
binóéng’a (K., N.) — Macaranga Tanarius
binóénga’mbàbi (K.) — Croton argyratus
bínsak’a (S., Kb.)
bínsat’a (S.) }, see bíntas’a
bíntas’a (K.) — Ficus variegata
bitáwa (N.)
bitáwak’a (S., Kb., P.)
bitáwat’a (K.) } — Calophyllum Inophyllum, C. soulattri
bitáwak bátoe (S.) — Planchonella firma
bítoen (N.) — Barringtonia asiatica
boeároh (K.) — Barringtonia racemosa
boeàs’a (K., S., N.) — Ficus leucantatoma
boelít’a, see boerít’a
bóéloeng’a, see bóéroeng’a
boenála (S.) — Chasalia curviflora
*boenároh (Kb.) — Scolopia ?spinosa
boeralá’a (K.) — Villebrunea rubescens
boeràn’a (S.) — Pisonia sylvestris
boerít’a (K., P.) — Garcinia Morella, G. rhizophoroides, G. sizygifolia
***bóéroeng’a (K., S.) — Bischofia javanica

boewíha (H.)
boewís’a (K., S., Kb.) } — Koordersiodendron pinnatum
bòsa (S., St.) — Citrus spec.
dalangíran’a (H.), see lalangíran’a
dalíta (K.), see laríta
dandámi (N.) = ? dendómeh
dandí’it (K.), see sub IV.
dandíla (d. mèoh) (K., S., N., M.) (cf. same name sub II) — Ehretia microphylla
dára (N.) — Desmodium umbellatum
dàra(t’a) (K., N.) — Allophylus Cobbe
dariángoh (H.), see lariángoh
daróénoe (M.), see sub IV.
deh (N.)
déisah (K.) }, see ráisah
dendómeh (M.) — Pipturus argenteus
*dóéngoel’a (S.) — Eugenia spec. (n. 3098)
ganggáil’a (P.) (cf. same name sub II) — Plectronia spec. (n. 3294)
garoeat’a (K.) — Rubus fraxinifolius
**gégeh (Kb.)
géheh (K., S., Kb.) } — Pometia spec. (n. 2982)
genémoh (Malay) — Gnetum gnemon
góémak’a (H.)
góémat’a (K., P.) } — Palaquium luzoniense
góémak’oe sángik’a (Kb.)
góémat’oe sángit’a (K., P.) } — Planchonella firma
góénoe (K.) — Antidesma Cumingii
goeràla’a (g. oeróéne) (K.) — Saurauia spec. (ns. 2638, 2883)
goro(gora) pantai (Malay; pantai = sea-shore) — Eugenia ?fastigiata
iáma (K., S.) — Inocarpus edulis
intámin (Malay) — Diospyros hebecarpa
kanoembóélan’a (K.), see panimbóéran’a
kiáma (M.), see iáma
kírah-kírah (K.) — mangrove tree, not collected (Xylocarpus spec.?)
la’abóé’oe (Kb.) — Strombosia philippinensis
la’abàn’a
la’awàn’a } (K., P.) — Phaleria urens
*lábah (K.) — Bridelia glauca, Matthaea sancta
**lábah (S.) — Symplocos spec. (n. 3097)
labéa (St.) — Carica Papaya L.
láhoe (K.) — Myristica ?celebica
laíta (K.), see laríta
làkas’a (St.) — ?(“iron-wood”)
laládon (N.) — Planchonella obovata
lála ejàn’a (K.) — Alsophila glauca
lalagàlan’a (K.) — Mussaenda aff. philippica
lalamóéran’a (K.) — Breynia cernua
lalangíran’a (K., S., Kb.) — Canangium odoratum
lalónda ésat’a (spiny)
„ wawíne (spineless) } (K.) — Acanthus ilicifolius
lampapèga (H.) — Melia Azedarach L.
lampàsia (K., Kb.) — Turpinia pomifera
lanángoh (K.), see lariángoh
landíla (l. mèoh), see dandíla
langatòra (K., S., Kb.) — Arthrophyllum diversifolium
„ (P.) — Tetraplasandra Koordersii
lángi (M.)
langík’a (K., S., Kb.) } — Albizzia saponaria
lángjas (N.) — Ficus spec. (n. 2535)
lángoe (K.) — Pandanus spec. (not collected)
lángoe ádoe (S.) — Gnetum gnemon
***lanóéang’a (K.) — Terminalia Copelandi
laragáran’a, see lalagáran’a

laramóéran’a, see lalamóéran’a
laràn’a (K., P., S., Kb., N.) — Horsfieldia glabra, H. novoguineensis
larangíran’a, see lalangíran’a
laransiàn’a (K., Kb., N.) — Acalypha amentacea
laransiàn’a oeróéne (K.) — Mallotus ricinoides
lara(n)siàn’oe paní’i(paníki) (S., Kb.) — Ficus pubinervis
larapéan’a (S., Kb., N.) — Pleomele spec. (n. 3075)
laràteh (N.) — Pseuderanthemum spec. (n. 3437)
lári (M.) — Excoecaria Agallocha
lariángoh (K., M.) — Parkia javanica
lariàsan (N.) — Ficus spec. (n. 3427)
lariasàn’oe paní’i (S.), see laransiàn’oe paní’i
larimóéta (M., N.) — Breynia cernua
laripàtoe (K., S., N.) — Boerlageodendron serratifolium
laríta (K.) — Avicennia marina, Ceriops Roxburghiana, Pongamia pinnata
laróénoe (N.), see sub IV.
la’tsi(n) (N.) — Garcinia tetrandra
lawéa (M.) — Sterculia comosa
*lawéang’a (S., Kb., M.) — Macaranga triloba
lendeh (K.) — Mallotus tiliifolius
**lèo (S.) — Pometia tomentosa
lèo’mbáwi (K., S.) — Dracontomelum dao
*ligisàt’a (S.) — Euonymus javanica
lilòka oeróéne (K.) — Hernandia ovigera
limbáloh (K.) — Oroxylon indicum Vent.
limbawóéta (K.) — Cerbera manghas
limbawòtang (K.) — Polyscias Rumphiana
límoe (N. Kar., St.) — Citrus spec.
língka oewíng’a (K.) — Artocarpus reticulata
linóék’a (P.) — Podocarpus neriifolia
**linsánad’a (K., S.) — Nothaphoebe umbelliflora
linsánad’a améada (P.) — Litsea spec. (n. 3314)
loeàn’a (Kb.), see amaloeàn’a
loeáran’a (S.) — Dillenia spec. (n. 3072)
lóéi (N.) — Sterculia ceramica
lóétoet’a (K.) — Pometia pinnata
lolòtan (P.) — Planchonella obovata
lóro (M.), see sub IV.
maíleh (M.) — Eugenia saligna
malalá’a, see maralá’a
malètah (K.) — Rinorea amboinensis
malimpètan’a (K.) — Lunasia amara
maliwáoe (H.), see mariwáoe
malóéntoh (P.) — Eugenia cymosa
maloempèt’a (K.) — Psychotria spec. (1)
mamáli (K.) — Leea aculeata, L. javanica
mamáli ésak’a (Kb.) }
„ wawíne (S.) } — Leea acuminata
mamántoe (K., N.) — Cyclostemon Minahassae
manái (N.) }
*manáik’a (S.) } — Millettia spec. (n. 3123)
*manáit’a (S., Kb.) }
mandalíroeng’a (K., P.) — Trema amboinensis
mángga ahoerángan (Kb., N.) — Arthrophyllum diversifolium
mangkóédoe (K.) — Morinda citrifolia
maniáoh (K.) — Cyathocalyx ?acuminatus
maralá’a (S., Kb., N.) — Pimeleodendron amboinicum
maràm’a (K., Kb.) (cf. naràm’a) — Melanolepis multiglandulosa
marapángi (N.) — Ficus spec. (not collected)
maratálam’a }
maratálang’a } (K.) — Evodia ?glabra, E. minahassae
marimbòs’a (K.) — Ximenia americana

marimbòs'a (S.) — Micromelum minutum
„ (P.) — Zanthoxylum Avicennae
maringkóépa (K., S.) — Eugenia spec. (n. 2623)
marísin karéa'a (K., P., Kb., N.) — Buchanania arborescens
*mariwáoe (S., Kb.) — Eugenia ?calubcob
màti'mpóéneh (K., S.), see nàki'mpóéneh
memàna'a (St.) — Areca Catechu L.
menái (N.) — Eugenia spec. (n. 3442)
míndang'a (K., S.) — Macaranga hispida
mò'ong'a (K.) — Terminalia spec. (n. 2824)
*nàkeh }
*nàki } (K., S., Kb.) — Canarium commune
nàki adío — Canarium commune with small fruit
„ bahéwa — „ „ „ large „
nàki'mbaráwo (K., P., Kb.) — Canarium asperum
nàki'mbawái (K., S., Kb.) — Ormosia calavensis
nàki'mpasá'an (P.) — Planchonella oxyedra
nàki'mpóéneh (S., Kb.) — Canarium balsamiferum
nanàsi (M.) — Bruguiera cylindrica
nanàsi ésat'a (K.) — Bruguiera conjugata, Rhizophora mucronata
„ wawíne (K.) — Bruguiera conjugata
nanítoe (K., P., S., Kb., N.) — Rhus rufa
nàra('a) (N., M.) }
naràm'a (S.) (cf. maràm'a) } — Melanolepis multiglandulosa
nári'mbaráwo (N.), see nàki'mbaráwo
nàti (K.), see nàki
nàti'mbaráwo (K., M.), see nàki'mbaráwo
nátji (H.), see nàki
natóénoe (K.), see sub IV.
**nátoh (K., N., M.) — Palaquium obtusifolium
ngíra (M.) — Pemphis acidula
nío (K., P., S.) — Gynostylus spec. (ns. 2856, 2906)
níoe }
nióék'a } (St.) — Cocos nucifera L.
nirád'a (P.) — Decaspermum spec. (n. 3278)
nóénoe'a (K., S., Kb.) — Ficus procera
nóénoe banáoe (S.) — Ficus spec. (n. 3168)
nóhnah (K., S.) — Ficus botryocarpa
nonáng'a (S.) — Cordia Myxa
noríng'a (K., Kb.) — Pisonia umbellifera
oelóék'a (K.) }
óéroe (M.) } — Artocarpus communis
omín'a (K.) (cf. same name sub IV) — Antirrhoea microphylla
pàdeh (p. ahoerángan) (K., S.) — Ficus heteropoda, F. subulata
pampára wawíran'a (K.) — Graptophyllum pictum
pamperóéda (K.) }
pampoelóéta (K.) (cf. same name sub IV) }, see bamboelóéda
pampoeróéda (S.) }
panambóéri (N., M.) — Ficus retusa
pándan'a (P.) — Pandanus tectorius
panggamóéil'a (K.) — Garcinia cornea
panimbóéran'a (N.) — Scaevola frutescens
„ (P.) — Scaevola micrantha
panimbóéri (M.), see panambóéri
pansaráng'a (K.) — Clerodendrum Buchanani
papángi'nàsoe (S.) — Crataeva religiosa
papára rawíran'a (K.), see pampára wawíran'a
**papíri (K., S.) — Eugenia spec. (ns. 2886, 2986)
párang'a (K., S.) — Barringtonia racemosa
*parabóénoet'a (S.) }
parawóénoe (N.) } — Aglaia ganggo
*parawóénoet'a (S.) }

peránti (K.) — Homalanthus populneus
paràpat'a (K.) — Sonneratia caseolaris
„ (P.) — Wikstroemia indica
péleh (N., M.) — Ficus ?kallicarpa
pèleh
pelèta (S.) — Ficus subulata
pilápi (K.) — Cleistanthus myrianthus
pilíneh (M.)
piríneh (N.) — Rapanea densiflora
póéwah (M.) (cf. boeàs'a) — Ficus leucantatoma
polòtan'a (K.) — Gymnacranthera Ibutii
**pongóéan'a (S.) — Elmerrillia ovalis
posi-posi (Malay) — Sonneratia caseolaris, Wikstroemia indica
raba'mpóéneh (P., N.) — Eugenia ?fastigiata
rabóéa (K.) — Mischophloeus paniculatus
ráisah (K.) — Pandanus spec. (n. 2992)
rámoet'a (P.), see áloe rámoet'a
randíla (r. mèoh), see dandíla
rapíri (K.) (cf. papíri) — Eugenia spec. (n. 2665)
riboesára (K.) — Pittosporum ferrugineum
riníta (K., S.) — Ficus Minahassae
saédeh (K., S.) — Gnetum gnemon
salingámbang (K.) — Jatropha Curcas L.
salíseh (cf. tamaríseh) — Terminalia spec. (n. 3370)
**samái (S., Kb.) — Bridelia minutiflora
samparoeái, see tamparoeáoe
sangíjoh (K., S., Kb.) — Evodia latifolia, Melicope triphylla
sánsoearàn'a (K., Kb., M.) — Commersonia Bartramia
sarái (K.) — Laportea spec. (n. 3007)
sároempaníran'a (S.) — Dalbergia ferruginea
saroeràn'a (S.) = ? sánsoearàn'a
sároh (K., N., M.) — Premna corymbosa
**saròtah (K., S.) — Terminalia spec. (n. 2884)
sasáli'mbanáran'a (P.) — Eugenia cymosa
sawòwoh (M.) — Lumnitzera littorea
sengíjoh, see sangíjoh
séra (M.) — Morinda citrifolia
siàpoe (K., S.) — Trichospermum eriopodum
***síkat'a (Kb.)
***síra (N.) — Intsia bijuga
***sírak'a (S.)
soepángka asoewàn'a (S.) — Clerodendrum Minahassae
sóéwi (N., M.) — Glycosmis pentaphylla
sóéwing'a (K., Kb.) — Ixora talaudensis
sóéwing'oe oeróéne (K.) — Discocalyx silvestris
sómbah (K.) — Clerodendrum inerme
sòsop (K.) — Boehmeria clidemioides, Maoutia Puya
sòsop ahoerángan (K.) — Pipturus incanus
tabóéroh (K.) — Cyclostemon littoralis
tahoelímpat'a (K., S., Kb., P.)
tahoerímpa (N.) — Cinnamomum celebicum, Litsea accedens,
tahoerímpat'a (K., S., Kb., P.) L. Forstenii
tamalísa (H.), see tamaríseh
*tamaríseh (S., Kb., N.) — Terminalia spec. (n. 3167)
*tamparoeáoe (K., P., S., Kb.) — Lepiniopsis ternatensis
**taná'a (Kb.) — Eugenia ?Everettii
tananáloep'a (K., S.) — Geunsia pentandra
taniroeàn'a (K.) — Buchanania arborescens, Campnosperma ?oxyrhachis
tara'óéoe (N.) — Antidesma ghaesembilla
taráoe'oe (K.) — Osbornia octodonta
taròtoh (K., Kb.) — Endospermum spec. (n. 2728)
tatimbàkas'a (K.) — Memecylon costatum

tatimbatára (K.) — Cinnamomum spec. (not collected)
tàtoe (N.) ⎫
tatóél'a (Kb.) ⎭ — Garuga floribunda
tatónta (N.) — Ficus spec. (n. 3452)
tènggeh (P.) — Fagraca ?ternatana
tengtaramiseàn'a (K.) — Astronia macrophylla, Maesa tetandra
tengtaramiscán ésak'a (S.) — Melastoma polyanthum
„ wawíne (S.) — Deeringia polysperma
„ „ (K.) — Saurauia spec. (n. 2754)
tipóéroe (K., P.) — Artocarpus communis
títoe oe palián (K.) — Palmarum spec. (n. 2916)
tóétoeng'a (K., S.) — Myristica ?celebica
*tóleh (K., P., S., Kb.) — Alphitonia sizyphoides
tolenàsoe (K.) — Codiaeum variegatum
„ (P.) — Styphelia moluccanum
wáloek'a (K.), see báloek'a
wároe, see bároe
**wároh (K., S.) — Duabanga moluccana
wawáni (M.) — Diospyros maritima
wíndoe (M.), see bíndoe(k'a)

II. Lianas and Climbers (Hemiparasites inclusive).

a'áloem bíran'a (S.) ⎫
„ wíran'a (K.) ⎭ — Connarus spec. (n. 3005), Jasminum suberosum
ála'oewàn'a (K.), see ára'oewàn'a
ánoe óése'a (S.) — Stephania hernandiifolia
anóéwoe (M.) (cf. same name sub IV) — Schefflera elliptica
aoeríta (K.) — Cissus spec. (n. 2484), Columella corniculata
apobóéroea (K.) — Cissus hastata, Hoya sussuela
apóékoeng'a (S.) — Ipomoea congesta
ápoet'oe aroembíran'a (K.) — Myxopyrum ovatum
ápoet'oe la'áwan'a (K.) — Strychnos spec. (n. 3333)
ára'oewàn'a (K.) — Epipremnopsis spec. (n. 2734), Pothos Rumphii, Scindapsus Cuscuaria
atántas'a (K.) (cf. same name sub I) — Ficus spec. (n. 2538)
bàgeh (K.) — Pueraria pulcherrima, P. Thunbergiana
baránggoh (K., P.) — Gnetum cuspidatum
bári-bári (M.) — Cassytha filiformis
bariwoeàn'a (K.) (cf. same name sub IV) — Ipomoea gracilis, I. tiliacea, Lygodium borneense, Tylophora Perrottetiana
bindóé'a (K.) — Medinilla pterocaula
boerá'an'a (K.) — Merremia peltata
dalàm'a, see daràm'a
dandíla (K.) (cf. same name sub I) — Medinilla pterocaula
daràm'a ⎫
daràmang'kahoerángan ⎭ (K.) — Piper abbreviatum, P. spec. (n. 2681)
ganggáila (g. ahoerángan) (K.) — Randia multiflora, Uncaria longiflora, U. spec. (n. 2621)
garànap'a (K.) — Dalbergia meneoides or Derris heterophylla (collected under the same number)
garoeat'a see sub I.
gíntoh (K.) — Lygodium circinnatum
kamánid'a (K.) — Calamus spec. (n. 2936)
lalagálan'a (K.), see sub I.
láling'oe àsoe (S.) — Piper abbreviatum
landèrong'a (K.) — Cissus nodosa, Tournefortia sarmentosa
laràteh (K.) — Clematis aristata
larímoe oeràn'a (K.) — Ficus recurva
lasàm'a (K.) — Gleichenia linearis
latára (K.) — Faradaya splendida
limpoeróés'a (K.) — Macropsychanthus dolichobotrys

língka oewíng'a (cf. same name sub I) — Ficus ?lanata
lóémoe (K.) — Lycopodium cernuum
lóéngkang (K.) — Mussaenda aff. philippica
mamíntak'a (K.) — Parsonsia Cumingiana
mariwoeàn'a (Kb.), see bariwoeàn'a
naówi (K.) — Clematis aristata
óéwa (N.)
oewàk'a (P., S.) — Flagellaria indica
oewàt'a (K.)
ondo (N.) — Ipomoea digitata
poeloetáng'a (K.) — Calamus spec. (n. 2937)
poendáneh (K.) — Vanieria cochinchinensis
poendángi (N.) — Hippocratea oblongifolia
„ (K.) — Gynochthodes spec. (n. 3332)
pòtòdára (K.) — Artabotrys macrantha
rimboàs'a (K.) — Piper sarmentosum
saràpat'a (K.) — Dioscorea oppositifolia
saráwat'oe wáwi (S.) — Smilax zeylanica
sároempaníran'a, see sub IV.
sasaríwoe (K.) — Adenia pandurata
sesònoh (M.) — Gymnema tingens
tabóéroe (K.) — Lophopyxis Maingayi
talimbá'as'a (K.) — Pericampylus glaucus, Stephania cauliflora
tatanároe waráwoh (K.) — Adenia pandurata

III. Epiphytes (Hemiparasites inclusive)

(am)baliáng'a (K.) — Cyclophorus adnascens
ára'ápa (M.) (cf. same name sub IV) — Asplenium adiantoides
araràn'a (K., P., S.) — Amyema celebica, Scurrula fusca
araràn'a késat'a (K.) — Amyema rigidiflora
baliáng'a (S.) — Lycopodium Phlegmaria
bóésa'oe palián (P.), see sub IV.
lóéngkoet'a — alle mosses
melángko (M.), see sub IV.
óéwak'oe piápi (P.) (cf. óéwak'a sub II) — Dendrobium lancifolium
tàbeng (M.) — Drynaria quercifolia
wáring garàtoe (K.) — Myrmecodia spec. (n. 2549)

IV. Herbs and Undershrubs.

abátoem'a (P.) — Echinochloa colonum
abóéroe (N.) — Polanisia icosandra
adóéroe (M.) — Cyperacea spec. (n. 3412), Desmodium gangeticum
àkeh (S.) — Imperata cylindrica Beauv., var. Koenigii Benth.
áloe'mpaliáng'a (K.) — Begonia spec. (ns. 2742, 2948, 2966)
áloe'mparánoh (K.) — Fatoua pilosa
ambóéroenga'mbàbi (K.) — Scoparia dulcis
ámi'mpiápi (P.) — Themeda gigantea
anàm'a (K., S.) — Amomum roseum
andaliaràn'a (K.) — Ipomoea Pes-caprae
anggaliára (N.) — Triumfetta procumbens
anóéwoe (M.) — Tacca leontopetaloides
ára'ápa (M.) (cf. same name sub III) — Nephrolepis biserrata
aráboe wówo'mbátoe (K.) — Pteris vittata
áring kámbing (K.) — Hyptis capitata
arompéna (M.) — Hemigraphis undulata
aróngan'a (S.) — Aracea spec. (n. 3116)
àteh (K.), see àkeh
aoelídi (M.) — Sorghum laxiflorum
babíseh (K.) — Elatostema polioneurum
bambádia (S.) — Helminthostachys zeylanica

bambaráwan'a (K.) — Aclisia sorzogonensis
bángoen'a (S.) — Polygonum minus
baráboet'a (K.) — Ischaemum muticum
bariwoeàn'a (K.) (cf. same name sub II) — Ipomoea gracilis
bawambánan'a (S.) — Donax canniformis
batàteh (K.) — Ipomoea Batatas Poir.
bengéla (K.) — Aracea spec. (n. 2991)
bèteh — Colocasia esculenta Schott
bíra — ? Colocasia esculenta Schott
boeràs'a (K.) — Saccharum spontaneum
bóésa('a) (St.) — Musa spec. (banana)
bóésa'oe palián (P.) — Dendrobium dimorphum
borontimóéka (K.) — Cyanotis axillaris
dandí'it (K.) — Abelmoschus moschatus, Bidens chinensis
daràteh (K.) — Physalis minima
daróénoe (M.), see natóénoe
dendí'i (M.) — Cenchrus Brownei
dendóéloeng (K.) — Riedelia curviflora
ganggóleh (K.) — Imperata cylindrica var. Koenigii, Sorghum propinquum
garòhom'a (K.) — Crinum asiaticum
láa'mbàbi (K.) — Jussieua angustifolia
lalóéga (Malay) — Cyrtosperma Merkusii
laróénoe (N.), see natóénoe
lelámpah (M.) — Brachiaria reptans
liléwan katowàn'a (K.) — Emilia sonchifolia
loempánsit'a (K.) — Corchorus acutangulus
lóro (M.) — Abelmoschus Manihot
manisàn'a (K., Malay; manis = sweet; the fruits are tasting sweet) — Passiflora foetida
maransàm'a (K.) — Blumea balsamifera
marióéoe (P.) — Dianella coerulea
maróéloem'a (Kb.) — Fatoua pilosa
melángko (M.) — Polypodium phymatodes
móéra araríntak'a (K.) — Polypodium longissimum
nanàroh (K.) — Ischaemum polystachyum
nanàsak'a (S.) — Mapania spec. (ns. 2990, 3141)
nanàsi (N. Kar., St.) — Ananas comosus Merr.
„ (P.) — Gahnia aspera
naníoe (N.) — Spathoglottis plicata
natíng'a (K., S., M.) — Abelmoschus Manihot
natóénoe (K.) — Wedelia biflora
nenàpoe (M.) — Oldenlandia biflora
óéta oe oedároh (K.) — Marasmius spec. (n. 2764)
óli'mpaliáng, see áloe'mpaliáng
omín'a (K.) (cf. same name sub I) — Ophiorrhiza spec. (1)
padóéoet oe papóéa (K.) — Oldenlandia pterita
paláni wawíra (K.) — Ilysanthes antipoda
pamparáwan'a (K.), see bambaráwan'a
pampóéloe (M.) — Euphorbia Atoto
pampoelóéta (K.) (cf. same name sub I) — Euphorbia serrulata
papárah (P.) — Cladium philippinense, Mariscus cyperinus
parangéna (S., St.) — Ananas comosus Merr.
paroewángi (M.) — Dryopteris Benoitiana
peòtah (K., S.) — Alpinia pectinata
pepántah (M.) — Mariscus pennatus
poeráha (K., M.) — Cyrtosperma Merkusii
pòhoh (K.) — Homalomena aromatica
radóéoet oe manároh (K.) — Ageratum conyzoides
randóéloeng, see dendóéloeng
róénti'i (M.) — Biophytum sensitivum
sa'ansáwa (K.), see sasáwa'a
saewóéa óétan (K.) — Hygrophila salicifolia

saibóéa (K.) — Stachytarpheta indica
sampadóéri (K.) — Commelina nodiflora, Floscopa scandens
sangkiróéman oe wáwi (K.) — Solanum torvum
saroempaníran'a (K., S.) — Dalbergia ferruginea
sasaráwi (K.) — Blumea lacera
sasáwa'a (K.) } — Calanthe spec. (n. 2989), Eulophia squalida, Spathoglottis
sasawá'an'a (S.) } plicata
sinosóan'a (K.) — Cyperacea spec. (n. 2513), Fimbristylis miliacea
tengtaramiseán wawíne, see sub I.
tentáiris (K.) — Alpinia pubiflora
tentajàsoe (K.) — Costus speciosus
tentàlas'a (K.) } — Aglaonema oblongifolium, Homalomena spec. (n. 3115)
tentàras'a (S.) }
tentarilómeh (M.) — Fimbristylis annua
tentárip'a (K., S., P., M.) — Scleria lithosperma, S. pubescens, Scleria scrobiculata
timàs'a (K.) — Rhaphidophora Korthalsii
toewoe (St.) — Saccharum officinarum L.

List of Morotai plant-names.

In Morotai an Alifuru language is spoken, belonging to the North Halmahera languages group. Of this language hardly any other data than the plantnames given below have come to my knowledge.

The only significance to which my attention was drawn is that of *Leptaspis urceolata*. The native name of this plant, or at any rate the name given to me was *bistiong kahomawogamaur*, which was said to signify: clinging to the hairs of the hand. Although this is probably a description rather than a current name, it is centainly very appropriate, since the inflorescences are covered by hook-shaped hairs and the spikelets get easily detached.

It may be added that *mabèka* and *manáver* mean female and male respectively. These words may, therefore, be compared with the Talaud words *wawíne* and *ésak'a*, which have been discussed on p. 131.

I. Trees and Shrubs.

abèteh — Mastersia Bakeri
atébeh — Homalium foetidum
atóboe — Pometia pinnata
banboerére — Conandrium spec. (n. 3505)
bemagiohíki — Dracontomelum dao
bòkocin — Gyronopsis Cumingiana
bólam — Anisoptera costata
dadátoko — Octomeles sumatrana
dédoro — Kleinhovia hospita
dodòfo — ?Olacacea spec. (n. 3571)
faai-faai — Annonacea spec. (n. 3496)
fitàko — Calophyllum soulattri
gibakolàno — Colona serratifolia
gohóra — Astronia ternatana
gòjen — Ficus Cassidyana
gomígo — Gronophyllum ?microcarpum
goséhi (Malay) — Nothaphoebe umbelliflora
háleh — Eugenia ?acutangula
hápo (Malay) — Canarium decumanum
harároko — Annonacea spec. (n. 3585), Polyalthia lateriflora
híleh — Castanopsis javanica

hobóéroe — Canarium decumanum
hòhòbòboh — Piper spec. (n. 3619)
hokaróéboe — Jagera serrata
hóro — Celtis latifolia
íroe — Vatica papuana
kitòjer — Macaranga hispida
kòbo-kòbo — Polyscias nodosa
kóéhoe-kóéhoe — Oldenlandia spec. (n. 3636)
koelèman — Horsfieldia Roxburghii
kohàka — Psychotria spec. (3)
kokarèboko — Ficus spec. (n. 3573)
kòko — Gironniera celtidifolia
kokoemóétoe — Horsfieldia sylvestris
korehára — Euphorbiacea spec. (n. 3595)
kotomóétoe, see kokomóétoe
ladatáit — Claoxylon longifolium
lían — Canarium lian
lían daoen lèbar — Haplolobus moluccanus
libériën — Pipturus velutinus
ligòjer — Manilkara Merrilliana
litòko — Buchanania amboinensis, Planchonella Vrieseana
lóéka-lóékam — Aglaia argentea
lowóra — Intsia bijuga
máko-mákor — Eugenia claviflora
máleh-máleh — Elaeocarpus Ganitrus
matóa (Malay) — Pometia pinnata
méata — Garcinia spec. (ns. 3603, 3679)
médeh-médeh — Canarium hirsutum
mòdor — Gomphandra australiana
móétingóéti — Osmelia philippina
momóana — Apocynacea (?Tabernaemontana) spec. (ns. 3658, 3676)
neríhaka — Canarium asperum
ngámin — Dracontomelum dao
ngetéda — Leea indica
ngodóro — Grewia ceramensis
níar — Canarium commune
nòoeng — Parastemon urophyllus
oehéli — Nothaphoebe umbelliflora
otéomawále — Planchonella firma
pangáha — Barringtonia acuminata
péa-péa — Endospermum formicarum
poelohári ⎫
poelosári ⎭ — Lepiniopsis ternatensis
rába — Ficus spec. (n. 3541)
rédi — Cerbera manghas
roekíti — Gnetum gnemon
salawàkoe (Malay) — Octomeles sumatrana
sáleh, see háleh
tatáoen — Laportea amplissima
tehíriki — Palaquium Lobbianum
tioa — Allophylus Cobbe
tòlom — Boerlageodendron spec. (n. 3514)
tómi-tómi — Eugenia formosa

II. Lianas and Climbers.

abéteh — Uncaria pedicellata
dongòta — Conocephalus suaveolens
hohinínga — Uncaria setiloba
róma — Flagellaria indica
ròtoe-ròtoe — Gynostemma pedatum
táli — Piper amboinense

toké — Calamus spec. (n. 3527)
toròhoekoe — Momordica cochinchinensis

III. Epiphytes.

bóékoh-bóékoh — Hydnophytum ?philippinense, H. spec. (n. 3602), Myrmecodia spec. (n. 3663)
hahai — Lycopodium pinifolium
lolomíti — Podochilus Lamii
totoehóéhoen(g) — Asplenium nidus
wéka-wéka — Drynaria rigidula

IV. Herbs and Undershrubs.

biáwa — Donax canniformis
bistiong kahomawogamaur — Leptaspis urceolata
djéla-djéla — Centotheca latifolia, Microstegium fasciculatum
goeabébeh — Impatiens spec. (n. 3575)
golióa — Marantacea spec. (n. 3465)
héhéwéheh — Cyperacea spec. (n. 3606), Mapania spec. (n. 3661)
héhéwéheh mabèka — Mapania spec. (n. 3546)
„ manáver — Mapania spec. (n. 3479)
kakáno — Sorghum propinquum
karahègóémi — Dryopteris invisa
kèkètokoe — Selaginella asperulipes, S. cupressoides
kèkètokoe mabèka — Selaginella Gaudichaudiana
„ manáver — Selaginella caudata
momoróétoe — Coix Lacryma-Jobi
óéga-óéga — Costus speciosus
pòpóko — Curculigo capitulata
róma — Plocoglottis spec. (n. 3558)

ACKNOWLEDGEMENTS.

Although the publication of this paper, partly on account of the nature of this sort of work, is considerably delayed, I wish to tender my best thanks to alle those corporations, government officials and private botanists, who have in some way contributed either to the expedition or to the publication of its results. Whereas the Indian Committee for Scientific Research (Indisch Comité voor Wetenschappelijke Onderzoekingen) granted a considerable sum, the Neth.-Indian Government paid the bulk of the expenses, mostly in the form of transportation and of the assistance by officials and coolies. First of all, my thanks are due to Dr W. M. Docters van Leeuwen, then director of the Government Botanic Gardens at Buitenzorg, to Dr J. G. B. Beumée, then Chief of the Herbarium and to Dr K. W. Dammerman, then Chief of the Zoological museum, of that institution, for their initiative and their generous help. Furthermore I am greatly indebted to Mr H. J. Schmidt, then Resident Magistrate of Manado for his kind interest in my work and particularly to Mr Eckenhausen, the then Civil Service officer at Beo, Karakelong, who not only helped me in every way in his power, but offered me a lavish hospitality in his house. In addition, I wish to thank those numerous individuals who helped me in many ways, whose names would form a list too long to publish here. Finally, my thanks are due to Dr J. H. F. Umbgrove, professor of Geology at Delft, for critically reading § 3 (General Part), and furthermore to those who kindly elaborated a part of my collection and whose names are enumerated in the Systematic Part.

I will not conclude these lines without having paid a warm tribute to the memory of my native Sundanese friend and assistant Iboet, whose modesty, zeal and devotion I will never forget. In his kind-heartedness he was entirely free from that arrogant would-be superiority which some of the semi-educated natives from Java deem well to show off in the presence of less-educated Malaysian peoples. In many of those inevitable quarrels with unwilling or too exacting coolies which seem to be inherent to every starting expedition, his tactful demeanour would settle matters in a short time and to everybody's contentment. After such a success Iboet became silent again and simply resumed his never-ending task. A few years after our return at Buitenzorg he quietly passed away, still a young man, of consumption.

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SYSTEMATIC PART.

(L. B. HOLTHUIS)

1. INTRODUCTION.

When the Pteridophytes and the Spermatophytes of Lam's Talaud and Morotai collection of 1926 were recently taken at hand, they had already been partly identified. Certain families which have been mentioned in the following papers, had been treated by specialists; the numbers in brackets indicate the pages on which the quotations in question may be found.

Bakhuizen van den Brink, R. C., Revisio *Ebenacearum* Malayensium (158, 224, 270) — Bull. Jard. Bot. Buitenzorg, Sér. III, 15, 1936—1938, 1.

Benl, G., Die Systematik der Gattung *Gahnia* Forst. (178) — Bot. Archiv. 1940, 151.

Danser, B. H., Die *Polygonaceen* Niederländisch-Ostindiens (180) — Bull. Jard. Bot. Buitenzorg, Sér. III, Vol. 8, 1927, p. 117.

——, The *Loranthaceae* of the Netherlands Indies (249, 329, 344, 365, 437, 450) — Bull. Jard. Bot. Buitenzorg, Sér. III, 11, 1931, 233.

Koster, Joséphine Th., The *Compositae* of the Malay Archipelago. I. Vernonieae and Eupatorieae (411, 419, 473, 489) — Blumea 1, 1935, 351.

Lam, H. J., Further Studies on Malayan *Sapotaceae* I (395, 398, 400, 411, 412, 467, 471, 472, 473, 474, 476, 481) — Bull. Jard. Bot. Buitenzorg, Sér. III, 8, 1927, 381.

——, The *Burseraceae* of the Malay Archipelago and Peninsula (329, 408, 437, 440, 464, 471, 487, 513) — Bull. Jard. Bot. Buitenzorg, Sér. III, 12, 1932, 281.

——, Note on the *Sapotaceae-Mimusopoideae* in general and on the far-eastern Manilkara-allies in particular (355) — Blumea 4, 1941, 323.

Markgraf, F., Monographie der Gattung *Gnetum* (438, 443, 478) — Bull. Jard. Bot. Buitenzorg, Sér. III, 10, 1930, 407.

Ooststroom, S. J. van, The *Convolvulaceae* of Malaysia III (502, 518, 531, 536, 561) — Blumea 3, 1940, 481.

Schröter, Hilde & Winkler, H., Monographie der Gattung *Elatostema* s. l. (107, 108) — Fedde Repert. Spec. Nov. Regn. Veget., Beih. 83, 1935, 1.

Slooten, D. F. van, The *Dipterocarpaceae* of the Dutch East Indies II (11) — Bull. Jard. Bot. Buitenzorg, Sér. III, 8, 1927, 1.

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Smith, J. J., On a collection of *Orchidaceae* from the Northern Moluccas — Bull. Jard. Bot. Buitenzorg, Sér. III, 11, 1931, 67.

Steenis, C. G. G. J. van, The *Bignoniaceae* of the Netherlands Indies (230) — Bull. Jard. Bot. Buitenzorg, Sér. III, 10, 1928, 173.

Other parts of the collection had been definitely (*) or provisorily identified without having been previously published. As far as could be ascertained, the following botanists, some of them at our request, have made identifications in all or some specimens belonging to the groups mentioned behind their names:

A. H. G. Alston: *Selaginellaceae**.

R. C. Bakhuizen van den Brink Jr.: *Melastomataceae**.

J. G. B. Beumée: *Lygodium, Taccaceae, Urticaceae, Magnoliaceae, Hernandiaceae, Pittosporaceae, Euphorbiaceae* (except *Antidesma*), *Tiliaceae, Sterculiaceae* (except *Pterospermum* and *Sterculia*), *Osbornia, Onagraceae, Rapanea, Loganiaceae, Apocynaceae, Boraginaceae.*

C. E. B. Bremekamp: *Acanthaceae**, *Rubiaceae**.

J. TH. HENRARD: *Gramineae**.
JOSÉPHINE TH. KOSTER: *Compositae**.
H. J. LAM: *Parkia, Antidesma, Sapindaceae, Gymnema, Verbenaceae** (with A. D. J. MEEUSE).
B. J. D. MEEUSE: *Intsia, Uraria, Pongamia, Inocarpus, Mucuna, Pueraria, Goodeniaceae.*
S. J. VAN OOSTSTROOM: *Convolvulaceae**.
O. POSTHUMUS: *Pteridophyta** (except *Selaginellaceae* and *Lygodium borneense*).
D. F. VAN SLOOTEN: *Flacourtiaceae**, *Combretaceae**.
J. WASSCHER: *Taxaceae**.

These identifications were, as far as necessary and possible, checked by me; the remaining specimens were all identified by me, except those retained at Buitenzorg, viz. the *Cyperaceae, Polygalaceae, Euphorbia* and the *Rhizophoraceae,* which were earlier checked there.

In the following list only those specimens have been mentioned, whose identification is practically certain. Yet, there are two categories; those identifications which are made by monographers or which for some other reason may be considered "final", are printed in normal roman type. To these a number of provisional identifications have been added in small print. They may be regarded reasonably and many of them even quite trustworthy. Their purpose is to provide the reader with a less incomplete survey of the flora of these islands. They have been dealt with in a somewhat more concise way.

Of the "final" identifications it may be said that, in case they have been quoted in previously published papers, these papers have been mentioned in addition to the first publication of the species; the latter has been cited for all species enumerated.

Geographical names have been given in the official orthography, recommended in the "Lijst van de voornaamste aardrijkskundige namen in den Nederlandsch-Indischen Archipel 1923" (Ed. 2). The following abbreviations have been used: Bz. = Herbarium of the Government Botanic Garden, Buitenzorg, Java; L. = National Herbarium (Rijksherbarium), Leiden; U. = Herbarium of the University, Utrecht; d. = dark; flow. = flowers; fr. = fruits; G. = Goenoeng (Gunong) = mountain; infl. = inflorescences; K. = Koeala (Kuala) = river; lvs. = leaves; l. = light; nat. n. = native name; N. = Noesa (Nusa) = island; P. = Poelau (Pulau) = island; sec. = secondary (forest).

Ladang = dry paddy field, in general, any field for cultivation; alang-alang = grass-vegetation (mainly *Imperata cylindrica*).

For the pronunciation of the native names, see General Part, § 7. Those native names, which, in some way, have been discussed in that paragraph are, in the Systematic Part, denoted by an * asterisk.

The localities have always been quoted by their number (e. g.: Loc. 4) as mentioned under Fig. 1, occasionally augmented by additional details.

The list contains only the Pteridophyta and the Spermatophyta. The Algae (1), Fungi and Lichenes (109) and Mosses (9), in total 119 numbers, as well as all specimens collected in the Minahasa (North Celebes) and Tidore (Moluccas) during the same trip, have been ignored.

The term Malaysia is used in accordance with Van Steenis's proposal (Gardens' Bull. Str. Settl. IX, 2, 1937, 188), including the Malay Peninsula, the Philippines and New Guinea.

The sequence of the families is those given in De Dalla Torre & Harms's Genera Siphonogamarum (1900—1907). Genera and species have been alphabetically arranged.

2. LIST OF UNIDENTIFIED SPECIMENS.

In order to provide the user with a complete survey of the collection, the following list gives an enumeration of the Pteridophytes (5) and Phanerogams (183), we were not able to identify. Some of these were retained at Buitenzorg and were, therefore, not available, others were too incomplete to allow an identification, but the greater part belong to critical genera in which the judgment of a specialist is required. It is probable that this category contains a number of new species or even genera. The order is alphabetical throughout (T. Talaud; M. Morotai).

Acanthaceae, T.: Pseuderanthemum (n. 3437); indet. (n. 2688, Staurogyne?).
Alangiaceae, T.: Alangium (n. 2854).
Annonaceae, T.: Mezzettia (n. 2898); indet. (n. 2582) — M.: indet. (ns. 3496, 3585).
Apocynaceae, M.: Tabernaemontana (ns. 3658, 3676).
Araceae, T.: Epipremnopsis (ns. 2734, 3143); Homalomena (n. 3115); indet. (ns. 2625, 2991, 3116) — M.: indet. (n. 3592).
Araliaceae, M.: Boerlageodendron (n. 3514).
Asclepiadaceae, T.: Dischidia (n. 3017); Tylophora (n. 2892).
Balsaminaceae, M.: Impatiens (n. 3575).
Begoniaceae, T.: Begonia (ns. 2742, 2948, 2966, 2967) — M.: Begonia (n. 3605).
Burmanniaceae, T.: Gymnosiphon (n. 2817).
Ceratophyllaceae, T.: Ceratophyllum (n. 3229).
Combretaceae, T.: Terminalia (ns. 2824, 2884, 3167, 3370).
Connaraceae, T.: Connarus (n. 3005) — M.: Santaloides (ns. 3458, 3569).
Cyperaceae, T.: Cladium (n. 3249); Cyperus (ns. 2513, 3412); Fimbristylis (n. 3026); Hypolytrum (n. 3069); Mapania (ns. 2749, 3141, 3330); indet. (ns. 2757, 2990, 3318) — M.: Mapania (ns. 3479, 3546, 3661); indet. (n. 3606).
Dilleniaceae, T.: Dillenia (n. 3072); Saurauia (ns. 2638, 2754, 2883).
Elaeocarpaceae, T.: Elaeocarpus (n. 3120).
Euphorbiaceae, T.: Antidesma (n. 2785); Baccaurea (n. 2657); Endospermum (ns. 2728, 2873); Macaranga (ns. 2859, 2894); indet. (n. 3321) — M.: indet. (ns. 3590, 3595, 3654).
Flacourtiaceae, M.: Flacourtia (n. 3568).
Gonystylaceae, T.: Gonystylus (ns. 2856, 2906).
Guttiferae, M.: Garcinia (ns. 3603, 3679).
Lauraceae, T.: Cinnamomum (n. 2903); Litsea (n. 3314) — M.: indet. (n. 3511).
Leguminosae, T.: Millettia (n. 3123, 3164).
Lemnaceae, T.: Lemna (n. 3231); Wolffia (ns. 3163, 3230).
Liliaceae, T.: Pleomele (n. 3075).
Loganiaceae, T.: Strychnos (n. 3333).
Marantaceae, M.: indet. (ns. 3465, 3598).

Meliaceae, T.: Aglaia (n. 3322); Chisocheton (n. 3204) — M.: Aglaia (ns. 3506, 3596).
Moraceae, T.: Ficus (ns. 2535, 2721, 3125, 3168, 3427, 3452) — M.: Ficus (ns. 3541, 3573).
Myrsinaceae, M.: Conandrium (n. 3515).
Myrtaceae, T.: Decaspermum (n. 3278); Eugenia (ns. 2623, 2632, 2665, 2886, 2940, 2986, 3098, 3442) — M.: (n. 3460).
Najadaceae, T.: Najas (n. 3232).
Olacaceae?, M.: indet. (n. 3571).
Orchidaceae, T.: Bulbophyllum (n. 3243); Calanthe (n. 2989); Corymborchis (n. 3064); Dendrobium (n. 3171); Tropidia (n. 3001); indet. (ns. 2804, 2805) — M.: Bulbophyllum (ns. 3494, 3523); Ceratostylis (n. 3554); Eria (n. 3549); Plocoglottis (n. 3558); Robiquetia (n. 3483); Taeniophyllum (n. 3482); indet. (ns. 3480, 3521, 3675).
Palmae, T.: Calamus (ns. 2936, 2937); indet. (n. 2916) — M.: Calamus (n. 3527).
Pandanaceae, T.: Freycinetia (n. 2891); Pandanus (n. 2992).
Piperaceae, T.: Piper (n. 2681) — M.: Piper (n. 3619).
Polypodiaceae, T.: Dryopteris (n. 2788) — M.: Dryopteris (ns. 3517, 3643).
Proteaceae, T.: Helicia (n. 3297).
Rubiaceae, T.: Amaracarpus (n. 2813); Argostemma (n. 2890); Canthium (ns. 3293, 3310); Dolicholobium (n. 2812); Gynochthodes (ns. 3137, 3332); Morinda (n. 3270); Myrmecodia (ns. 2549, 3020, 3304, 3324); Ophiorrhiza (n. 3079); Plectronia (n. 3294); Psychotria (ns. 3252, 3306); Uncaria (n. 2621); Xanthophytum (n. 2696); indet. (n. 2612; Bikkia?) — M.: Amaracarpus (n. 3513); ? Guettarda (n. 3542); Myrmecodia (n. 3663); Myrmephytum (n. 3602); Oldenlandia (n. 3636); Ophiorrhiza (ns. 3488, 3591, 3659); Psychotria (ns. 3474, 3512, 3535).
Sapindaceae, T.: Pometia (n. 2982).
Selaginellaceae, T.: Selaginella (ns. 3240, 3403).
Symplocaceae, T.: Symplocos (n. 3097).
Triuridaceae, T.: Sciaphila (ns. 2865, 3107).
Urticaceae, T.: Elatostema (ns. 2717, 2735, 2778, 2809, 3213); Laportea (n. 3007) — M.: Elatostema (ns. 3520, 3633).
Vitaceae, T.: Cissus (n. 2484); indet. (n. 2921) — M.: indet. (n. 3589).
Zingiberaceae, M.: indet. (n. 3559).

3. ENDEMIC SPECIES.

Talaud — Argostemma spec., Artabotrys macrantha, Canthium spec., Dendrobium dimorphum, D. talaudense, Discocalyx silvestris, Dolicholobium spec., Gymnacranthera Ibutii, Gynochthodes spec., Hemigraphis undulata, Ixora talaudensis, Jasminum suberosum, Macropsychanthus dolichobotrys, Microstylis purpureo-viridis, M. talaudensis, Morinda spec., Myrmecodia spec. (1), Psychotria spec. (1), Uncaria spec.

Morotai — Dicymanthes hexameres, Dryopteris spec. (2), Memecylon protrusum, Myrmecodia spec. (2), Myrmephytum spec., Ophiorrhiza spec. (2), Podochilus Lamii, Psychotria spec. (2), P. spec. (3).

4. NEW GENERA, SPECIES, VARIETIES AND COMBINATIONS, PUBLISHED IN THIS PAPER.

Artabotrys macrantha Holth., Astronia ternatana Bakh. f., Desmofischera Holth., D. monosperma Holth., Discocalyx silvestris Holth., Gymnacranthera Ibutii Holth., Hemigraphis ceramensis Brem., H. Rumphii Brem. with var. angustifolia Brem., var. gracilis Brem. and var. pubescens Brem., H. undulata Brem., Hydnophytum inerme (Gaud.) Brem., Jasminum suberosum Holth., Lachnostoma apoda (Val.) Brem., Macropsychanthus dolichobotrys Holth., Memecylon protrusum Bakh. f., Nauclea mitragyna (Miq.) Brem.

6. ENUMERATION OF THE SPECIES.

PTERIDOPHYTA.

LYCOPODIACEAE (O. Posthumus)

Lycopodium cernuum L., Sp. Pl., 1753, 1103.

Karakelong, Loc. 1, alang-alang field, alt. 5 m, April 28: *n. 2679* — Loc. 7, G. Piapi, clearing in forest, alt. 350 m, June 2: *n. 3308* (more or less climbing, bright green, sporangiophores l. yellowish brown; nat. n.: *lóémoe*) — Nenoesa, Loc. 10, Merampi, G. Maranggi, alang-alang field on sandstone, alt. 170 m, June 13: *n. 3422* (plant. l. green, sporangiophores l. brown).

Distribution: pantropic.

Lycopodium Phlegmaria L., Sp. Pl., 1753, 1101.

Karakelong, Loc. 2, old forest, alt. 50 m, May 4: *n. 2827* (epiphytic, pendulous, lvs. bright green, stem l. brown, sporangiophores l. green) — Salebaboe, Loc. 3, G. Ajambana, old forest, alt. 250 m, May 25: *n. 3170* (same annotations as n. 2827; nat. n.: *baliáng'a).*

Distribution: paleotropic.

Lycopodium pinifolium Bl., Enum., 1828, 264.

Morotai, Loc. 12, old forest, alt. 50 m, June 20: *n. 3461* (epiphytic, pendulous, lvs. d. green, stem brownish green, sporangiophores green, sporangia yellow; nat. n. *hahai*).

Distribution: Malaysia and New Caledonia.

SELAGINELLACEAE (A. H. G. Alston)

Selaginella asperulipes v. A. v. R., Mal. Ferns & Allies, suppl. 1, 1917, corr. p. 70.

Morotai, Loc. 12, old forest, alt. 250 m, June 25: *n. 3608* (terrestrial, stem l. green, lvs. bright green above, l. green below, sporangiophores dull l. green; nat. n.: *kèkètokoe*).

Distribution: Moluccas (Halmahera, Morotai, Ternate, Obi).

Selaginella caudata (Desv.) Spring, Mon. 2, 1849, 139.

Morotai, Loc. 12, old forest, alt. 40 m, June 20: *n. 3477* (entire plant l. green, paler at base, stem dirty green; nat. n.: *kèkètokoe *manáver*).

Distribution: Java, Moluccas (Morotai, Ternate, Ceram, Ambon, Aroe Islands) and New Guinea.

Selaginella cupressina (Willd.) Spring, Bot. Zeit. 1, 1838, 211.

Karakelong, Loc. 2, old forest, alt. 150 m, April 30: *n. 2686* (terrestrial, stem green, lvs. l. green, sporangiophores l. green, pale brown with age).

Morotai, Loc. 12, old forest, alt. 160 m, June 23: *n. 3572* (same annotations as n. 2686, but sporangiophores d. green; nat. n.: *kèkètokoe*).

Distribution: Java?, Philippines, Talaud, Moluccas (Morotai, Tidore, Ternate, Ceram, Ambon).

Selaginella Gaudichaudiana Spring, Mon. 2, 1849, 149.

Morotai, Loc. 12, old forest, alt. 40 m, June 20: *n. 3478* (terrestrial, lvs. bright green above, l. green below, stem dirty green at base, adult sporangiophores yellow; nat. n.: *kèkètokoe *mabèka*).

Distribution: Moluccas (Morotai, Ceram), New Guinea.

Selaginella involvens (Sw.) Hieron., Hedwigia 50, 1911, 2.

Karakelong, Loc. 2, old forest, alt. 250 m, May 2: *n. 2761* (terrestrial, l. green, stem lighter).

Distribution: tropical Asia to New Guinea.

OPHIOGLOSSACEAE (O. Posthumus)

Helminthostachys zeylanica (L.) Hook., Gen., 1842, t. 47A.

Salebaboe, Loc. 3, north of G. Ajambana, swampy place in sec. forest, alt. 260 m, May 22: *n. 3117* (terrestrial, stem dirty green, lvs. bright green, sporangia green; nat. n.: *bambádi'a*).

Distribution: tropical Asia to the Carolines, New Guinea, Australia and New Caledonia.

Ophioglossum pendulum L., Sp. Pl., ed. 2, 1763, 1518.

Karakelong, Loc. 2, old forest, alt. 150 m, May 7: *n. 2889* (epiphytic, pendulous, entire plant bright green).

Distribution: tropical Asia to Polynesia.

ANGIOPTERIDACEAE (O. Posthumus)

Angiopteris evecta (Forst. f.) Hoffm., Comm. Soc. Reg. Gött. 12, 1796, 29, t. 5.

Karakelong, Loc. 2, old forest, bank of rivulet, alt. 50 m, May 3: *n. 2790* (terrestrial, lvs. l. green, lighter below, 3.10 m long, stipules dull d. brown, sporangia l. brown).

Distribution: paleotropic.

SCHIZAEACEAE (O. Posthumus, except *Lygodium borneense*).

Lygodium borneense v. A. v. R., Bull. Jard. Bot. Buitenzorg, Sér. II, Nr. 20, 1915, 29.

Karakelong, Loc. 1, sec. forest, alt. 60 m, April 24: *n. 2554* (lvs. green, sporangia brownish green).

Distribution: Borneo, Talaud.

Lygodium circinnatum (Burm.) Sw., Syn., 1806, 153.

Karakelong, Loc. 1, sec. forest, alt. 5 m, April 23: *n. 2511* (climbing, lvs. bright green, sporophylls d. green; nat. n.: *gíntoh*) — Kaboeroeang, Loc. 4, sec. forest, May 26: *n. 3199* (lvs. d. green, slightly paler below, sporophylls darker, petioles and stems l. green, slightly brown).

Distribution: tropical Asia to Micronesia and N. Australia.

Lygodium scandens (L.) Sw., Schrad. Journ. 1800^2, 1801, 106.

Karakelong, Loc. 1, alang-alang field, alt. 100 m, April 25: *n. 2598* (lvs. and sporangia l. green, stems l. brown).

Distribution: tropical Asia to Australia.

Schizaea dichotoma (L.) Sm., Mém. Ac. Turin 5, 1793, 422, t. 9, fig. 9.

Karakelong, Loc. 1, east of Beo, cleared forest in ravine, alt. 30 m, April 25: *n. 2568* (lvs. green, sporangia l. brown) — Loc. 2, old forest, alt. 250 m, May 2: *n. 2758* (lvs. l. green, sporangia d. brown); May 8: *n. 2914* (lvs. l. green, sporangia l. green, brown with age) — Loc. 7, G. Piapi, open sunny slope, under shrubs, alt. 400 m, May 31: *n. 3236* (lvs. green, stems green to reddish brown, slightly violet, sporangia bright brown).

Morotai, Loc. 12, old forest, alt. 50 m, June 20: *n. 3484* (lvs. green, stem greenish brown below, sporangia green, brown with age).

Distribution: Madagascar, tropical Asia to Polynesia.

Schizaea digitata (L.) Sw., Syn., 1806, 150, 380, t. 4, fig. 1.

Karakelong, Loc. 1, cleared old forest, alt. 120 m, April 27: *n. 2667* (terrestrial, lvs. d. green, sporangia l. green, brown with age); Pasir Malap, east of Lobo, old forest, alt. 50 m, May 13: *n. 2997* (same annotations as n. 2667).

Distribution: tropical Asia and Polynesia.

GLEICHENIACEAE (O. Posthumus)

Gleichenia linearis (Burm.) Clarke, Trans. Linn. Soc. Bot. 1, 1880, 428.

Karakelong, Loc. 1, sec. vegetation along wayside, alt. 120 m, April 27: *n. 2658* (lvs. bright green, stems l. green, brown at base, forming dense masses, sporangia l. green; nat. n.: *lasàm'a*) — Nenoesa, Loc. 10, Merampi, G. Maranggi, open sandstone plateau, between alang-alang, alt. 170 m, June 13: *n. 3421* (creeping, lvs. bright green, stems and petioles l. brown, sporangia very l. brown).

Distribution: pantropic.

HYMENOPHYLLACEAE (O. Posthumus)

Trichomanes cupressoides Desv., Prodr., 1827, 330.

Karakelong, Loc. 2, old forest, alt. 100 m, May 2: *n. 2752* (terrestrial, lvs. d. green, petioles black, indusium d. green).

Distribution: tropical Africa and Asia to New Guinea.

Trichomanes humile Forst. f., Prodr., 1786, 84.

Karakelong, Loc. 2, bank of K. Bahewa, on rocks, alt. 30 m, May 12: *n. 2969* (entire plant d. green).

Distribution: Malay Peninsula and Formosa to Polynesia.

Trichomanes millefolium Presl, Hym., 1843, 16, 43.

Karakelong, Loc. 2, old forest, on rock, alt. 80 m, May 4: *n. 2834* (lvs. d. green, petioles d. brown, indusium brown).

Distribution: Malaysia to Australia and Polynesia.

Trichomanes rhomboideum Sm., Journ. Bot. 3, 1841, 417.

Morotai, Loc. 12, old forest, alt. 50 m, June 21: *n. 3525* (lvs. d. green, indusium d. green, sporangia d. brown).

Distribution: Java, Celebes, Philippines, Moluccas.

Trichomanes sumatranum v. A. v. R., Bull. Dépt. Agric. Ind. Néerl. 18, 1908, 4.

Karakelong, Loc. 2, old forest, alt. 80 m, May 2: *n. 2751* (lvs. d. green, petioles and roots black, indusium brown).

Distribution: Sumatra, Java, Borneo, Talaud. Closely related species occur in eastern Malaysia.

CYATHEACEAE (O. Posthumus)

Alsophila Fenicis (Cop.) C. Chr., Ind., suppl., 1913, 5.

Karakelong, Loc. 7, G. Piapi, open forest, ravine, alt. 320 m, June 2: *n. 3319* (fern tree, 4 m high, trunk 3 m high, black, lvs. d. green above, paler below, sporangia coffee-brown, ramenta d. brown, petioles green above, d. brown and shining below; nat. n.: *atomòning'a*).

Distribution: Batan Islands (northern Philippines), Talaud, Tidore.

Alsophila glauca (Bl.) Sm., Journ. Bot., 3, 1841, 419.

Karakelong, Loc. 2, old forest, alt. 100 m, April 30: *n. 2703* (fern tree, about 13 m high, lvs. bright green above, l. green below, sporangia d. brown, petioles d. green); steep bank of K. Tatamboewe, alt. 50 m, May 3: *n. 2791* (same annotations as n. 2703; nat. n.: *lála ejàn'a*).

Distribution: tropical Asia to New Guinea.

POLYPODIACEAE (O. Posthumus)

Acrostichum aureum L., Sp. Pl., 1753, 1069.

Karakelong, Loc. 1, south of Beo, mangrove, alt. 2 m, April 23: *n. 2516* (sporophylls brown).

Distribution: pantropic.

Adiantum flabellulatum L., Sp. Pl., 1753, 1095.

Karakelong, Loc. 7, G. Piapi, open sunny slope, under grass, alt. 350 m, May 31: *n. 3255* (terrestrial, lvs. d. green, petioles black, sporangia d. brown).

Distribution: China, Indo-China and Malay Peninsula to Japan, Philippines, Moluccas and Lesser Sunda Islands.

Antrophyum callifolium Bl., Enum., 1828, 111.

Karakelong, Loc. 2, old forest on riverbank, alt. 50 m, May 1: *n. 2705* (epiphytic, lvs. l. green, sporangia d. green); old forest, alt. 50 m, May 4: *n. 2830* (epiphytic, lvs. coriaceous, d. green, sporangia brown).

Morotai, Loc. 12, old forest, alt. 60 m, June 20: *n. 3487* (same annotations as n. 2830); Marilako, old forest, alt. 20 m, June 29: *n. 3670* (epiphytic, lvs. not coriaceous, d. green above, l. green below, sporangia d. brown).

Distribution: Madagascar to Polynesia.

Aspidium decurrens Presl, Rel. Haenk. 1, 1825, 28.

Morotai, Loc. 12, Goegoeti, G. Ligòjer, old forest on limestone, bank of rivulet, alt. 60 m, June 24: *n. 3600* (terrestrial, lvs. d. green above, paler below, nerves and petioles d. violet brown, sporangia d. brown).

Distribution: S.E. Asia to Polynesia.

Aspidium Leuzeanum (Gaud.) O. Ktze, Bot. Zeit., 1846, 474.

Salebaboe, Loc. 3, G. Ajambana, old forest, bank of rivulet, alt. 220 m, May 22: *n. 3111* (terrestrial, lvs. bright green, petioles bright reddish brown, greenish towards apex, sporangia brown, ramenta brown).

Distribution: India and S. China to Australia and Polynesia.

Aspidium pentaphyllum v. A. v. R., Bull. Dépt. Agric. Ind. Néerl. 18, 1908, 16.

Salebaboe, Loc. 3, G. Ajambana, old forest, alt. 280 m, May 23: *n. 3142* (terrestrial, lvs. dull green, paler below, nerves d. greenish brown, sporangia bright brown, petioles shining d. brown).

Morotai, Loc. 12, old forest, alt. 100 m, June 21: *n. 3518* (same annotations as n. 3142).

Distribution: Talaud, Morotai, New Guinea.

Aspidium polymorphum Wall., Cat., 1828, n. 382.

Karakelong, Loc. 2, old forest on riverbank, alt. 50 m, April 30: *n. 2701* (stout terrestrial, lvs. l. green, petioles brownish green, sporangia l. brown).

Distribution: India, Birma, Malay Peninsula, Java, Lesser Sunda Islands.

Asplenium adiantoides (L.) C. Chr., Ind., 1905, 99.

Karakelong, Loc. 2, old forest, alt. 50 m, May 4: *n. 2828* (epiphytic, lvs. bright green above, l. green below, petioles brown at base, green near apex, sporangia brown); old forest, alt. 250 m, May 8: *n. 2911* (same annotations as n. 2828); old forest, alt. 150 m, May 11: *n. 2954* (same annotations as n. 2828) — Salebaboe, Loc. 3, G. Ajambana, old forest, alt. 260 m, May 23: *n. 3114* (lvs. very l. green, petioles shining black, sporangia l. brown) — Miangas, Loc. 9, G. Batoe, on rock, alt. 80 m, June 11: *n. 3383* (same annotations as n. 2828; nat. n.: **ára'ápa*).

Morotai, Loc. 12, old forest, alt. 50 m, June 20: *n. 3485* (same annotations as n. 2828).

Distribution: paleotropic.

Asplenium nidus L., Sp. Pl., 1753, 1079.

Karakelong, Loc. 2, old forest, alt. 50 m, May 1: *n. 2732* (epiphytic, lvs. shining d. green above, paler below, midrib brown, sporangia l. brown).

Morotai, Loc. 12, alt. 100 m, June 22: *n. 3548* (epiphytic, lvs. bright green, midrib and petioles d. green, sporangia d. brown; nat. n.: *tòtoehóéhoen*); Goegoeti, G. Ligòjer, old forest on limestone, alt. 60 m, June 24: *n. 3601* (same annotations and nat. n. as n. 3548).

Distribution: paleotropic.

Asplenium scandens Sm., Journ. Bot. 3, 1841, 408.

Karakelong, Loc. 2, old forest, alt. 80 m, May 4: *n. 2835* (climbing, lvs. d. green, petioles darker, indusia very l. green).

Distribution: Borneo, Philippines, Talaud, Moluccas, New Guinea, Micronesia, Polynesia.

Asplenium scolopendrioides Sm., Journ. Bot. 3, 1841, 408.

Morotai, Loc. 12, old forest, alt. 50 m, June 20: *n. 3468* (epiphytic, lvs. d. green above, paler below, sporangia d. brown).

Distribution: Borneo, Philippines, Moluccas, New Guinea.

Asplenium tenerum Forst. f., Prodr., 1786, 80.

Karakelong, Loc. 2, old forest, alt. 50 m, May 4: *n. 2833* (epiphytic, lvs. bright green, petioles with brown rib below, sporangia l. brown).

Distribution: Seychelles to Polynesia.

Cheilanthes tenuifolia (Burm.) Sw., Syn., 1806, 129, 332.

Kaboeroeang, Loc. 5, alang-alang field, alt. 150 m, May 27: *n. 3210* (terrestrial, lvs. d. green, petioles d. brown, shining, sporangia d. green).

Distribution: tropical Asia to Australia and Polynesia.

Cyclopeltis novo-guineensis Ros., Fedde Repert. 10, 1912, 329.

Kaboeroeang, Loc. 5, K. Ampas, on rocks in rivulet, alt. 50 m, May 27: *n. 3214* (terrestrial, lvs. shining d. green above, dull l. green below, petioles green of brownish green, sporangia brown).

Distribution: Talaud, New Guinea.

Cyclophorus acrostichoides (Forst. f.) Presl, Epim., 1849, 130.

Morotai, Loc. 12, Goegoeti, G. Ligòjer, old forest on limestone, alt. 100 m, June 24: *n. 3599* (epiphytic, lvs. coriaceous, dirty l. green, sporangia cinnamon-brown).

Distribution: India to Australia and Polynesia.

Cyclophorus adnascens (Sw.) Desv., Berl. Mag. 5, 1811, 300.

Karakelong, Loc. 1, in coconut plantation, alt. 6 m, April 23: *n. 2476* (climbing, lvs. l. green, sporangia coffee-brown; nat. n.: *ambaliáng'a*) — Salebaboe, Loc. 3, G. Ajambana, old forest, alt. 260 m, May 23: *n. 3147* (epiphytic, lvs. l. green, sporangia ruddy brown) — Miangas, Loc. 9, G. Kota, on rocks, alt. 90 m, June 11: *n. 3389* (same annotations as n. 3147).

Distribution: paleotropic.

Davallia solida (Forst. f.) Sw., Schrad. Journ. 1800^2, 1801, 87.

Karakelong, Loc. 2, old forest, alt. 60 m, May 2: *n. 2756* (epiphytic, lvs. l. green, slightly paler below, petioles l. green, sporangia l. brown) — Salebaboe, Loc. 3, G. Ajambana, old forest, alt. 260 m, May 23: *n. 3145* (same annotations as n. 2756, rhizome with dark brown ramenta).

Distribution: tropical Asia to Australia and Polynesia.

Diplazium silvaticum (Bory) Sw., Syn., 1806, 92.

Morotai, Loc. 12, Marilako, old forest, alt. 20 m, June 29: *n. 3678* (terrestrial, lvs. d. green above, l. green below, petioles brownish black, sporangia l. brown).

Distribution: pantropic.

Drynaria quercifolia (L.) Sm., Journ. Bot. 3, 1841, 398.

Miangas, Loc. 9, G. Soro, open slope, alt. 60 m, June 11: *n. 3386* (epiphytic, lvs. bright green, slightly darker above, sporangia l. brown; nat. n.: *tàbeng*).

Distribution: tropical Asia to Australia and Polynesia.

Drynaria rigidula (Sw.) Bedd., Ferns Br. Ind., 1869, t. 314.

Morotai, Loc. 12, Goegoeti, riverbank, alt. 40 m, June 26: *n. 3622* (epiphytic, lvs. d. green, slightly paler below, petioles d. brown, sporangia d. cinnamon-brown; nat. n.: *wéka-wéka*).

Distribution: tropical Asia to Polynesia.

Drynaria sparsisora (Desv.) Moore, Ind., 1862, 348.

Morotai, Loc. 12, old forest, alt. 90 m, June 21: *n. 3503* (epiphytic, lvs. bright green, shining, nerves l. yellow above, brown below, sporangia brown).

Distribution: Ceylon to tropical Australia and Polynesia.

Dryopteris Benoitiana (Gaud.) v. A. v. R., Mal. Ferns, 1908, 225.

Miangas, Loc. 9, coconut plantation, alt. 5 m, June 12: *n. 3411* (terrestrial, lvs. dull green, petioles greenish brown, sporangia brown; nat. n.: *paroewángi*).

Distribution: Miangas, Moluccas.

Dryopteris calcarata (Bl.) O. Ktze, Rev. Gen. Pl. 2, 1891, 812.

Karakelong, Loc. 2, bank of K. Bahewa, on rocks, alt. 30 m, May 12: *n. 2968* (lvs. bright green above, slightly paler below, petioles pale brown at base, sporangia greenish brown).

Distribution: India and S. China to Polynesia.

Dryopteris gongylodes (Schk.) O. Ktze, Rev. Gen. Pl. 2, 1891, 811.

Salebaboe, Loc. 6, Lota swamp near Moronge, alt. 5 m, May 28: *n. 3220* (terrestrial, lvs. bright green, paler below, petioles l. green, sporangia brown, rhizome d. brown).

Distribution: pantropic.

Dryopteris invisa (Forst. f.) O. Ktze, Rev. Gen. Pl. 2, 1891, 813.

Morotai, Loc. 12, Marilako, cleared grounds, alt. 20 m, June 29: *n. 3672* (terrestrial, lvs. bright green, petioles d. brown, sporangia brown; nat. n.: *karahègóémi*).

Distribution: Philippines, Morotai, New Guinea, Polynesia.

Dryopteris unita (L.) O. Ktze, Rev. Gen. Pl. 2, 1891, 811.

Karakelong, Loc. 1, coconut plantation, alt. 5 m, April 23: *n. 2515* (lvs. d. green, petioles shining, almost black, sporangia dark brown).

Distribution: Mascarenes, Seychelles, tropical Asia to Polynesia.

Dryopteris spec.

Karakelong, Loc. 2, steep bank of K. Tatamboewe, alt. 50 m, May 3: *n. 2786a*; old forest, bank of rivulet, alt. 50 m, May 3: *n. 2788* (terrestrial, lvs. l. green, petioles brown, l. green when young, sporangia brown, young leaves slimy).

Remark: According to an annotation by Dr. Posthumus these two specimens are identical with a specimen from New Guinea (coll. *Docters van Leeuwen n. 10734*).

Humata Gaimardiana (Gaud.) Sm., Lond. Journ. Bot. 1, 1842, 425.

Salebaboe, Loc. 3, G. Ajambana, old forest, alt. 260 m, May 23: *n. 3146* (climbing, lvs. bright green, paler below, petioles l. green, sporangia l. brown, rhizome reddish brown).

Distribution: Birma and Malay Peninsula to Polynesia.

Hymenolepis mucronata Fée, Gen., 1850—'52, 82.

Karakelong, Loc. 2, old forest on riverbank, alt. 50 m, May 1: *n. 2704* (epiphytic, lvs. l. green, midrib in older leaves violet below, sporangia cinnamon-brown).

Distribution: tropical Asia to Australia and Polynesia.

Lindsaya concinna Sm., Journ. Bot. 3, 1841, 415.

Morotai, Loc. 12, old forest, alt. 60 m, June 22: *n. 3544* (terrestrial, lvs. d. green, petioles and sporangia d. brown).

Distribution: Borneo, Philippines, Morotai.

Lindsaya decomposita Willd., Sp. Pl. 5, 1810, 425.

Karakelong, Loc. 2, old forest, alt. 100 m, April 30: *n. 2685* (terrestrial, lvs. d. green, petioles shining d. brown, sporangia d. brown); old forest, alt. 80 m, May 2: *n. 2753* (same annotations as n. 2685).

Morotai, Marilako, old forest, alt. 20 m, June 28: *n. 3644* (same annotations as n. 2685).

Distribution: tropical Asia to Australia and Polynesia.

Lindsaya gracillima Cop., in Perk., Fragm., 1905, 181.

Karakelong, Loc. 2, on rocks in ravine, alt. 50 m, May 5: *n. 2848* (terrestrial, lvs. bright green, petioles shining d. brown, sporangia d. brown).

Distribution: Philippines, Talaud.

Lindsaya pectinata Bl., Enum., 1828, 217.

Karakelong, Loc. 2, old forest, alt. 60 m, April 30: *n. 2687* (climbing, lvs. dull green, stem d. brown, sporangia d. brown).

Distribution: tropical Asia to New Guinea.

Lindsaya tenuifolia Bl., Enum., 1828, 219.

Karakelong, Loc. 2, old forest, alt. 60 m, April 30: *n. 2684* (terrestrial, lvs. and petioles l. green, sporangia d. brown); old forest, alt. 220 m, May 2: *n. 2759* (same annotations as n. 2684) — Salebaboe, Loc. 3, G. Ajambana, old forest, alt. 300 m, May 22: *n. 3118* (same annotations as n. 2684).

Morotai, Loc. 12, old forest, alt. 60 m, June 21: *n. 3519* (same annotations as n. 2684).

Distribution: Java?, Philippines, Talaud, Moluccas (Morotai, Ternate, Ceram), New Guinea, Polynesia.

Microlepia manilensis Presl, Tent., 1836, 125.

Karakelong, Loc. 2, old forest, alt. 80 m, May 4: *n. 2822* (terrestrial, lvs. l. green, petioles brown, sporangia pale brown).

Distribution: Java?, Celebes, Talaud, Philippines.

Monogramma paradoxa (Fée) Bedd., Ferns Br. Ind., suppl., 1876, 24.

Morotai, Loc. 12, old forest, alt. 100 m, June 21: *n. 3524* (epiphytic, lvs. bright green, sporangia brown).

Distribution: Ceylon to Polynesia.

Nephrolepis biserrata (Sw.) Schott, Gen. Fil. 2, 1834, 10.

Karakelong, Loc. 1, sec. forest, alt. 50 m, April 24: *n. 2521* (terrestrial, lvs. bright green, petioles d. brown, sporangia coffee-brown) — Loc. 2, old forest, bank of rivulet, alt. 50 m, May 3: *n. 2787* (same annotations as n. 2521) — Miangas, Loc. 9, in coconut plantation, alt. 5 m, June 12: *n. 3409* (same annotations as n. 2521; nat. n. **ára'ápa*).

Distribution: pantropic.

Nephrolepis hirsutula (Forst. f.) Presl, Tent., 1836, 79.

Kaboeroeang, Loc. 4, wayside, sec. forest, alt. 20 m, May 26: *n. 3192* (terrestrial, lvs. d. green above, slightly paler below, petioles shining d. brown, sporangia d. brown) — Miangas, Loc. 9, in coconut plantation, alt. 5 m, June 12: *n. 3410* (terrestrial, lvs. bright green, petioles l. green, sporangia brown).

Distribution: pantropic.

Polypodium harpophyllum Zenker in O. Ktze, Linnaea 24, 1851, 256.

Morotai, Loc. 12, old forest, alt. 80 m, June 21: *n. 3502* (epiphytic, lvs. dull green, paler below, stems and petioles brown, sporangia brown).

Distribution: paleotropic.

Polypodium heracleum O. Ktze, Bot. Zeit., 1848, 117.

Karakelong, Loc. 2, riverbank, old forest, alt. 40 m, May 3: *n. 2789* (epiphytic, lvs. l. green, midrib brown below, sporangia l. yellow when young, l. brown with age).

Distribution: Malay Peninsula, Sumatra, Java, Borneo, Celebes, Philippines, Moluccas, New Guinea.

Polypodium longissimum Bl., Enum., 1828, 127.

Karakelong, Loc. 1, open swampy grounds, alt. 10 m, April 25: *n. 2573* (lvs. bright green, sporangia cinnamon-brown; nat. n. *móéra araríntak'a*).

Distribution: tropical Asia to Polynesia.

Polypodium musifolium Bl., Enum., 1828, 134.

Morotai, Loc. 12, Goegoeti, G. Ligòjer, old forest, alt. 50 m, June 27: *n. 3629* (epiphytic, lvs. bright green, slightly paler below, midrib brown below, sporangia very d. brown).

Distribution: Malay Peninsula, Sumatra, Java, Borneo, Philippines, Moluccas, New Guinea, ? Lesser Sunda Islands.

Polypodium obtusissimum C. Chr., Ind., 1906, 549.

Karakelong, Loc. 7, G. Piapi, open sunny slope, alt. 400 m, May 31: *n. 3237* (epiphytic, lvs. d. green above, paler below, sporangia d. coffee-brown).

Morotai, Loc. 12, old forest, alt. 60 m, June 22: *n. 3552* (epiphytic, lvs. dull l. green, paler below, sporangia brown).

Distribution: Philippines, Talaud, Morotai.

Polypodium phymatodes L., Mant., 1771, 306.

Karakelong, Loc. 2, old forest, alt. 50 m, May 4: *n. 2829* (epiphytic, lvs. bright green, paler below, petioles brown, sporangia d. brown, rhizome greenish brown); old forest, alt. 150 m, May 11: *n. 2951* (same annotations as n. 2829); some locality and date: *n. 2952* (same annotations as n. 2829) — Kaboeroeang, Loc. 4, sec. forest, wayside, alt. 20 m, May 26: *n. 3196* (terrestrial, further same annotations as n. 2829) — Miangas, Loc. 9, in coconut plantation, alt. 5 m, June 11: *n. 3376* (same annotations as n. 3196; nat. n. *melángko*).

Distribution: paleotropic.

Polypodium punctatum (L.) Sw., Schrad. Journ. 1800^2, 1801, 21.

Karakelong, Loc. 2, old forest on riverbank, alt. 50 m, May 1: *n. 2731* (epiphytic, lvs. l. green, sporangia l. brown).

Distribution: paleotropic.

Pteris longipinnula Wall., Cat., 1828, n. 108.

Karakelong, Loc. 2, old forest on bank of K. Tatamboewe, alt. 50 m, April 30: *n. 2700* (stout terrestrial, lvs. d. green, midrib and petioles shining d. brown, sporangia d. brown); same loc., old forest, alt. 200 m, May 10: *n. 2932* (terrestrial, lvs. d. green above, paler below, midrib and petioles very d. brown, sporangia cinnamon-brown, indusium l. green).

Distribution: tropical Asia to Polynesia.

Pteris melanocaulon Fée, Gen., 1850—'52, 127.

Karakelong, Loc. 2, bank of K. Tatamboewe, alt. 50 m, May 2: *n. 2750* (epiphytic, lvs. bright green, petioles shining very d. brown, indusium l. green, sporangia l. brown).

Distribution: Philippines, Talaud, Moluccas (Soela Islands, Ceram, Ambon).

Pteris vittata L., Sp. Pl., 1753, 1074.

Karakelong, Loc. 2, edge of landslide, alt. 50 m, May 11: *n. 2959* (lvs. l. green, petioles l. greenish brown, sporangia l. brown; nat. n.: *aráboe *wówo'mbátoe*).

Distribution: tropical Asia to Australia and Polynesia.

Schizoloma ensifolium (Sw.) Sm., Journ. Bot. 3, 1841, 414.

Karakelong, Loc. 1, east of Beo, alang-alang field, alt. 100 m, April 25: *n. 2590* (lvs. bright green, petioles brown, sporangia brown); sunny skirt of forest, alt. 120 m, April 27: *n. 2668* (same annotations as n. 2590) — Salebaboe, Loc. 3, south of Liroeng, alang-alang field, alt. 50 m, May 21: *n. 3087* (same annotations as n. 2590).

Distribution: paleotropic.

Schizoloma ovatum (Sm.) Cop., Phil. Journ. Sci. Bot., suppl. 4, 1906, 252.

Karakelong, Loc. 7, G. Piapi, open sunny slope under shrubs, alt. 350 m, May 31: *n. 3234* (lvs. bright green, petioles d. brown, sporangia brown).

Distribution: Borneo, Celebes, Philippines, Talaud.

Taenitis blechnoides (Willd.) Sw., Syn., 1806, 24, 220.

Morotai, Loc. 12, old forest, alt. 60 m, June 22: *n. 3545* (terrestrial, lvs. d. green, paler below, petioles d. brown, green towards apex, sporangia d. brown); Marilako, old forest, alt. 20 m, June 28: *n. 3617* (same annotations as n. 3545).

Distribution: paleotropic.

Tapeinidium moluccanum (Bl.) C. Chr., Garden's Bull. Str. Settl. 4, 1929, 399.

Karakelong, Loc. 7, top of G. Piapi, shady place, alt. 500 m, May 31: *n. 3238* (terrestrial, lvs. bright green, petioles violet-brown, sporangia l. brownish green).

Morotai, Loc. 12, old forest, swampy place, alt. 100 m, June 25: *n. 3609* (terrestrial, lvs. d. green, slightly paler below, petioles d. brown, paler and more green towards apex, sporangia very d. brown).

Distribution: Borneo, Celebes, Moluccas (Ceram, Ambon), New Guinea.

Vittaria elongata Sw., Syn., 1806, 109, 302.

Karakelong, Loc. 7, G. Piapi, open forest, alt. 350 m, June 2: *n. 3325* (epiphytic, lvs. bright green, sporangia almost black).

Morotai, Loc. 12, old forest, alt. 60 m, June 20: *n. 3467* (entire plant d. green).

Distribution: tropical Asia to Australia and Polynesia.

SPERMATOPHYTA

GYMNOSPERMA

TAXACEAE (J. Wasscher)

Podocarpus neriifolia D. Don in Lambert, Gen. Pinus, ed. 1, 1824, 21.

Karakelong, Loc. 7, G. Piapi, open sunny slope, alt. 350 m, May 31: *n. 3261* (tree, 8 m high, bole 4.6 m, straight, bark grey, minutely scaling, lvs. coriaceous, bright green, pink when young, anthers greenish white to l. pink; nat. n.: *linóék'a*).

Distribution: Himalaya and S. China to Polynesia.

Remarks: This specimen was erroneously mentioned by Wasscher in his study on the Malaysian species of *Podocarpus* (Blumea 4, 1941, 359) under *P. polystachya* R. Br., at a suggestion of Dr. Lam; the specimen was not available at the time and could, therefore, not be checked. After the publication of his paper, however, the specimen was eventually discovered in the Rijksherbarium and was then identified as *P. neriifolia*. On the map on p. 428 in Wasscher's paper, the area of *P. polystachya* is accordingly drawn to wide.

GNETACEAE (F. Markgraf)

Gnetum cuspidatum Bl., Rumphia 4, 1848, 5; Markgraf, Bull. Jard. Bot. Buit., Sér. III, 10, 1929, 475.

Karakelong, Loc. 2, frequent in old forest, alt. 170 m, May 2: *n. 2760* (long liana, infl. l. green); alt. 250 m, May 8: *n. 2909* (long liana, lvs. d. green and shining above, paler below, branchlets cinnamon-brown, infl. green, fr. l. green, reddish brown at apex, eaten roasted; nat. n.: *baránggoh*) — Loc. 7, G. Piapi, light forest, alt. 350 m, Jnue 2: *n. 3317* (stem containing a great quantity of very bitter liquid; same nat. n.).

Distribution: Malay Peninsula, Sumatra, Java, Borneo, Celebes, Talaud, Soela.

Gnetum gnemon L., Mant. I, 1767, 125.

Var. **domesticum** (Rumph.), Markgraf, l.c., 1929, 437.

Karakelong, Loc. 1, east of Beo, sec. forest, alt. 100 m, April 24: *n. 2545* (small tree, 4 m high, fr. bluish green; nat. n.: *saédeh*) — Loc. 2, frequent in old forest along riverbank, alt. 15 m, May 16: *n. 3034* (small tree, 8 m high, bark greyish brown, branchlets brown, lvs. shining above, fr. dull olive-green; nat. n.: *saédeh*; bast fibres used for making ropes) — Salebaboe, Loc. 3, G. Ajambana, old forest, alt. 250 m, May 22: *n. 3113* (small tree, 8 m high, 0.16 m diam., bole 4 m high, straight, fr. dirty green, slightly red at apex; nat. n.: *saédeh* (Tl.) or *genémoh* (Malay); leaves and fruits eaten as vegetables).

Morotai, Loc. 12, fairly frequent in old forest, alt. 130 m, June 22: *n. 3557* (small tree, 8 m high, fr. l. green; nat. n.: *roekiti*).

Distribution of the variety: Celebes, Philippines, Talaud, Moluccas, Soemba, New Guinea, Bismarck- and Solomon Islands.

Var. **silvestre** (Brongn.) Parl. in DC., Prodr. 16, 1868, 349; Markgraf, l.c. 1929, 443.

Karakelong, Loc. 7, G. Piapi, open sunny slope, alt. 350 m, May 31: *n. 3275* (small tree, 4 m high, fr. l. green, turning orange-yellow; nat. n.: *saédeh*).

Distribution of the variety: N. Celebes, Talaud, Moluccas (Ceram, Ambon), New Guinea, Solomon Isl., Bismarck Isl., Fiji.

Distribution of the species: Assam to Fiji.

ANGIOSPERMAE

Monocotyledoneae

PANDANACEAE

Freycinetia De-Vriesei Solms, Linnaea 42, 1878—1879, 96.

Karakelong, Loc. 2, old forest, frequent, alt. 50 m, May 1: *n. 2724*.

Distribution: Celebes, Talaud, Halmahera.

Pandanus latissimus Bl., Rumphia 1, 1835, t. 53.

Karakelong, Loc. 2, N. Maraloem, on the beach, May 16: *n. 3041* (tree, 5 m, stiltroots 2 m; nat. n.: *ababá'a*).

Distribution: Talaud, Banda.

Pandanus tectorius Sol., Journ. Linn. Soc. 17, 1878, 63.

Karakelong, Loc. 9, G. Piapi, very frequent on sunny slope, alt. 350 m, May 31: *n. 3284* and *3285* (tree, 3—3.5 m; nat. n.: *pándan'a*).

Distribution: Mascarenes to Polynesia.

ALISMACEAE

Caldesia reniformis (D. Don) Makino, Bot. Mag. Tokyo 20, 1906, 34.

Saleba boe, Loc. 6, Lota swamp near Moronge, alt. 5 m, frequent, May 28: *n. 3224* (herb, lvs. yellowish green, calyx l. green, corolla white, filaments white, anthers yellow, ovary l. green).

Distribution: Madagascar, India, China, Japan, Talaud, N. Australia.

TRIURIDACEAE

Sciaphila tenella Bl., Bijdr., 1825, 515.

Karakelong, Loc. 2, Pasir Malap, old forest, alt. 40 m, May 13: *n. 2996* (entire plant bright red, saprophyte).

Distribution: W. Java, W. Borneo, Philippines, Talaud.

GRAMINEAE (J. Th. Henrard)

Brachiaria reptans (L.) Gardn. & Hubb. in Hooker, Ic. Pl., 1938, 3, t. 3363.

Miangas, Loc. 9, G. Soro, grass-slope, alt. 80 m, June 11: *n. 3395* (lvs. l. green, infl. l. green; nat. n.: *lelámpah*).

Distribution: pantropic.

Cenchrus Brownei Roem. & Schult., Syst. 2, 1817, 258.

Miangas, Loc. 9, G. Batoe, open grass-slope, alt. 70 m, June 11: *n. 3393* (lvs. bright green, infl. l. green; nat. n.: *dendí'i*).

Distribution: Annam, Java, Celebes, Philippines, Miangas, Moluccas, Timor, New Guinea, Australia, tropical America.

Centotheca latifolia (Osb.) Trin., Fund. Agrost., 1820, 141.

Karakelong, Loc. 1, sec. forest, alt. 100 m, April 27: *n. 2647* (lvs. l. bluish green, infl. l. green); recent landslide, alt. 40 m, May 3: *n. 2781*).

Morotai, Loc. 12, old forest along trail, 330 m alt., June 25: *n. 3612* (nat. n.: *djéla-djéla*).

Distribution: India and S. China to Polynesia.

Coelorhachis glandulosa (Trin.) Stapf, in Ridley, Fl. Mal. Penins. 5, 1925, 204.

Karakelong, Loc. 1, wayside, between alang-alang, alt. 100 m, April 26: *n. 2620* (entire plant bright green, infl. green).

Distribution: Sumatra, Java, Borneo, Celebes, Philippines (Panay, Palawan), Talaud, Moluccas (Ceram), Solomon Islands, New Caledonia.

Coix Lacryma-Jobi L., Sp. Pl., 1735, 972.

Morotai, Loc. 12, Marilako, cleared grounds, alt. 20 m, June 29: *n. 3671* (l. green, fr. l. green when young, turning yellow, d. brown and grey with age, ultimately white; nat. n.: *momoróétoe*).

Distribution: originally paleotropic, now pantropic.

Cyrtococcum oxyphyllum (Hochst.) Stapf in Hooker, Ic. Pl., 1922, t. 3096.

Karakelong, Loc. 2, border of recent landslide, alt. 50 m, May 11: *n. 2960* (stem prostrate, lvs. bright green, l. green below, infl. l. green).

Distribution: Seychelles to Philippines, New Guinea and Australia.

Digitaria microbachne (Presl) Henr., Meded. 's Rijks Herb. 61, 1930, 13.

Karakelong, Loc. 2, sunny bank of K. Bahewa, recent landslide, alt. 40 m, May 3: *n. 2780* (entire plant l. green, infl. very l. green).

Distribution: Sumatra, Java, Philippines, Talaud, Moluccas, New Guinea.

Echinochloa colonum (L.) Link, Hort. Berol. 2, 1833, 209.

Karakelong, Loc. 8, north of Dahang, grass vegetation, alt. 5 m, June 4: *n. 3347* (lvs. bright green, vaginae of older leaves reddish, infl. l. green; nat. n.: *abátoem'a*).

Distribution: pantropic.

Eragrostis unioloides Nees in Steudel, Syn. Pl. Glum. 1, 1854, 264.

Karakelong, Loc. 1, wayside, alt. 100 m, April 27: *n. 2670* (lvs. green, infl. green, brown with age).

Distribution: India and S. China to Philippines, Celebes, Talaud, Soela Islands and Timor.

Garnotia stricta Brongn. in Bot. Duperr. Voy., 1829, 132, t. 21.

Karakelong, Loc. 2, bank of K. Tatamboewe, on rocks, alt. 50 m, May 12: *n. 2971* (entire plant l. green).

Distribution: India, Sumatra, Java, Borneo, Philippines, Talaud, Moluccas (Ternate).

Hymenachne amplexicaulis (Rudge) Nees, Agrost. Bras., 1829, 276.

Saleboboe, Loc. 6, Lota swamp near Moronge, alt. 5 m, May 28: *n. 3222* (stem prostrate, lvs. bright green, infl. l. green).

Distribution: India and S. China to Philippines and Moluccas, tropical America.

Ischaemum muticum L., Sp. Pl., 1753, 1049.

Karakelong, Loc. 1, open grounds, alt. 5 m, April 23: *n. 2483* (lvs. green, bracts l. green, anthers l. yellow, style white; nat. n.: *barâboet'a*); sec. forest, alt. 80 m, April 24: *n. 2526* (climbing over shrubs, several m long, lvs. l. green, vaginae brown, stigma white; nat. n.: *baráboet'a*) — Salebaboe, Loc. 3, wayside, alt. 20 m, May 21: *n. 3091*.

Distribution: India to Philippines, New Guinea and the Solomon Islands.

Ischaemum polystachyum Presl, Rel. Haenk. 1, 1830, 328.

Karakelong, Loc. 1, wayside, alt. 5 m, April 28: *n. 2682* (stem more or less prostrate, lvs. dull green, ears l. green; nat. n.: *nanároh*) — Salebaboe, Loc. 3, wayside, alt. 20 m, May 21: *n. 3090* (stem partly prostrate, lvs. l. green, hairs white, ears l. green, style greenish white).

Distribution: India, Sumatra, Borneo, Philippines, Talaud, Moluccas (Halmahera, Ceram), New Guinea.

Leptaspis urceolata (Roxb.) R. Br. in Benn., Pl. Jav. Rar., 1838, 23, t. 6.

Morotai, Loc. 12, Marilako, old forest, alt. 20 m, June 28: *n. 3640* (nat. n.: **bistiong kahomawogamaur*).

Distribution: Ceylon to Philippines and New Guinea.

Microstegium fasciculatum (L.) Henr., Blumea 3, 1940, 453.

Morotai, Loc. 12, old forest along trail, alt. 330 m, June 25: *n. 3613* (nat. n.: *djéla-djéla*).

Distribution: India and Indo China to Philippines, Celebes and Morotai.

Monerma repens (Forst.) Beauv., Agrost., 1812, 117.

Miangas, Loc. 9, P. Baronto, on limestone, alt. 7 m, June 11: *n. 3367a*.

Distribution: Ceylon to Polynesia.

Oplismenus undulatifolius (Ard.) Beauv., Agrost., 1812, 54.

Morotai, Loc. 12, old forest, along trail, alt. 330 m, June 25: *n. 3614*.

Distribution: Europa to Asia and Australia.

Panicum Crus-galli L., Sp. Pl., 1753, 56.

Karakelong, Loc. 2, on gravel bank in K. Bahewa, alt. 15 m, May 15: *n. 3023*.

Distribution: pantropic.

Paspalum longifolium Roxb., Fl. Ind., ed. I, 1, 1820, 283.

Karakelong, Loc. 1, east of Beo, sunny wayside, alt. 100 m, April 26: *n. 2618* (bright green, infl. l. green when young, d. violet-red with age, style d. violet).

Distribution: India and S. China to Polynesia.

Saccharum spontaneum L., Mant. 2, 1771, 183.

Karakelong, Loc. 2, Pasir Malap, riverbank, alt. 20 m, May 14: *n. 3018* (herb, up to 4 m, infrutescences shining brownish-white; nat. n.: *boeràs'a*).

Distribution: India and S. China to Polynesia.

Sacciolepis aurita (Presl) Camus in Lecomte, Fl. Gén. Indo-Chine 7, 1922, 459.

Salebaboe, Loc. 3, Donan Timbalang'a, shore of a small lake, alt. 250 m, May 24: *n. 3161* (lvs. bright green, infl. l. green).

Distribution: India, Sumatra, Java, Borneo, Philippines, Talaud.

Sorghum laxiflorum Bailey, Bellenden-Ker Exped., 1889, 70.

Miangas, Loc. 9, G. Batoe, grass-covered slope, alt. 90 m, June 11: *n. 3392* (lvs. bright green, infl. l. green, awns violet-brown; nat. n.: *aoelídi*).

Distribution: Philippines (Luzon), Miangas, New Guinea, Australia.

Sorghum propinquum (Kunth) Hitchc., Lingn. Sc. Journ. 7, 1931, 249.

Karakelong, Loc. 8, north of Dahang, June 4: *n. 3350* (nat. n.: *ganggóleh*).

Morotai, Loc. 12, on gravel banks in river, June 23: *n. 3578* (herb, 4 m tall; nat. n.: *kakáno*).

Distribution: China, Tonkin, Sumatra, Philippines, Talaud, Moluccas, Soemba.

Sporobolus elongatus R. Br., Prodr., 1810, 170.

Karakelong, Loc. 8, north of Dahang, wayside, alt. 5 m, June 4: *n. 3346* (nat. n.: *sinosóan'a*).

Distribution: Japan to Australia.

Themeda gigantea (Cav.) Hack. in DC., Mon. Phan. 6, 1889, 670.

Karakelong, Loc. 7, G. Piapi, very frequent on open slope, alt. 300 m, June 2: *n. 3328* (nat. n.: **ámi'mpiápi*; together with *Scleria lithosperma* and *Cladium* spec. n. 3249, this species is the main component of the grassy vegetation of the slopes of Mt. Piapi).

Distribution: Celebes, Philippines, Talaud, Moluccas.

CYPERACEAE

Cladium philippinense Merr., Phil. Journ. Sci. Bot. 5, 1910, 171.

Karakelong, Loc. 7, G. Piapi, open slope: *n. 3248* (nat. n.: *papárah*).

Distribution: Philippines, Talaud.

Cyperus distans L. f., Suppl., 1781, 103.

Karakelong, Loc. 2, on gravel bank in river: *n. 3021*.

Distribution: pantropic.

Fimbristylis annua (All.) Roem. & Schult., Syst. 2, 1817, 95.

Miangas, Loc. 9, open slope: *n. 3388* (nat. n.: *tentarilómeh*).

Distribution: pantropic.

Fimbristylis miliacea (L.) Vahl, Enum. 2, 1806, 287.

Karakelong, Loc. 1, sec. forest: *n. 2594* (nat. n.: *sinosóan*).

Distribution: pantropic.

Fimbristylis spathacea Roth, Nov. Sp. Pl., 1821, 24.

Miangas, Loc. 9, P. Baronto: *n. 3367*.

Distribution: pantropic.

Gahnia aspera (R. Br.) Spreng., Syst. 2, 1825, 114; Benl, Bot. Arch. 49, 1940, 176.

Karakelong, Loc. 7, G. Piapi, open sunny slope, alt. 460 m, May 31: *n. 3246* (fr. shining brown-orange coloured, bracts very d. brown; nat. n.: *nanàsi*).

Distribution: S. Japan, Brit. N. Borneo, Talaud, Australia, Polynesia.

Remarks: The genus comprises, according to Benl (l. c.) about 37 species. Of these 21 occur in Australia, 9 in Polynesia, 7 in New Zealand and 6 in Malaysia. The generic area reaches S. China and S. Japan in the northwest, Hawaii in the northeast, the Marquesas and Rapa in the east and Sumatra, British Malaya and Siam in the west, but its centre is undoubtedly the Australian continent. The same holds true concerning *G. aspera*, whose area extends as far east as Rapa and

Raivavae. Benl (l. c.) mentions Elphinstone Bay, Celebes, as a locality. This is almost certainly a mistake for Brit. N. Borneo.

Kyllinga brevifolia Rottb., Descr. Ic., 1773, 13, t. 4, fig. 3.
Karakelong, Loc. 2, on gravel bank in river: *n. 3031*.
Distribution: pantropic.

Mariscus cyperinus (Retz) Vahl, Enum., 2, 1806, 377.
Karakelong, Loc. 2, riverbank: *n. 2779*; *n. 2957* (nat. n.: *papárah*).
Distribution: India to Polynesia.

Mariscus pennatus (Lam.) Merr., Enum. Phil. Flow. Pl. 1, 1925, 113.
Karakelong, Loc. 1, border of mangrove vegetation: *n. 2512* — Miangas, Loc. 9, swamp: *n. 3415* (nat .n.: *pepántah*).
Distribution: paleotropic.

Rhynchospora corymbosa (L.) Britt., Trans. N. Y. Acad. Sci. 11, 1892, 84.
Salebaboe, Loc. 6, Lota swamp, frequent: *n. 3223*.
Distribution: pantropic.

Scleria hebecarpa Nees in Wight, Contrib., 1834, 117.
Var. **pubescens** C. B. Clarke in Hook. f., Fl. Br. Ind. 6, 1894, 689.
Miangas, Loc. 9, open slope: *n. 3387* (fr. shining greenish white; nat. n.: *tentáripa*).
Distribution: S.E. Asia and Malaysia.

Scleria lithosperma (L.) Sw., Prodr., 1788, 18.
Karakelong, Loc. 7, G. Piapi, open slope, frequent: *n. 3247* (infl. brown; nat. n.: *tentáripa*; before the paddy harvest some infrutescenses are bound together and deposited in the house in order to turn out the demons, cf. *indoeng padi* = mother of the paddy, in Java).
Distribution: pantropic.

Scleria scrobiculata Nees in Wight, Contrib., 1834, 117.
Karakelong, Loc. 1, wayside: *n. 2520* (fr. greenish white; nat. n.: *tentáripa*) — Salebaboe, Loc. 3, in alang-alang, very frequent: *n. 3152* (herb, up to 2.5 m, fr. and nat. n. as n. 2520).
Distribution: S.E. Asia to Micronesia.

Torulinium ferax (Rich.) Ham., Prodr. Pl. Ind. Occ., 1825, 151.
Karakelong, Loc. 2, riverbank, very frequent: *n. 3022*.
Distribution: pantropic.

PALMAE

Gronophyllum ? microcarpum Scheff., Ann. Jard. bot. Buit. 1, 1876, 153.
Morotai, Loc. 12, old forest, 100 m alt., June 22: *n. 3551* (tree, 7 m high; nat. n.: *gomígo*).
Distribution: Morotai, Ceram, Ambon.

Mischophloeus paniculatus (Scheff.) Scheff., l.c. 152.
Karakelong, Loc. 2, old forest, alt. 50 m, May 3: *n. 2792* (tree on stilt-roots, about 9 m high, infl. l. yellow; nat. n.: *rabóéa*).
Distribution: Celebes, Talaud, Ternate, Batjan.

ARACEAE

Aglaonema oblongifolium (Roxb.) Kunth, Enum. 3, 1841, 55.
Karakelong, Loc. 2, Pasir Malap, frequent in forest on riverbank, alt. 20 m, May 14: *n. 2988* (nat. n.: *tentalás'a*) — Kaboeroeang, Loc. 5, in cleared forest, alt. 100 m, May 27: *n. 3209* (fr. shining fiery red).
Distribution: Malay Peninsula, Borneo, Philippines, Talaud, Moluccas.

Cyrtosperma Merkusii (Hassk.) Schott, Oest. Bot. Woch. Bl., 1859, 61.
Miangas, Loc. 9, in swamps: *n. 3406* (terrestrial, cult.; nat. n.: *poeráha* [Tal.] or *laloega* [Malay]).
Distribution: Sumatra to New Guinea (the specimen is spineless and conformable with specimens from Halmahera in Herb. Buitenzorg).

Homalomena aromatica (Roxb.) Schott, Melet. 1, 1832, 20.
Karakelong, Loc. 1, old forest, alt. 90 m, April 26: *n. 2636* (terrestrial, spadix

yellow) — Loc. 2, Pasir Malap, frequent in forest on riverbank, alt. 20 m, May 14: *n. 2999* (nat. n.: *pòhoh*) — Salebaboe, Loc. 3, sec. forest, alt. 180 m, May 20: *n. 3060* (spatha and spadix creamy white).

Distribution: India to New Guinea.

Pothos Rumphii Schott, Melet. 1, 1832, 21.

Karakelong, Loc. 2, old forest, alt. 60 m, May 2: *n. 2740* (climbing, about 40 m high); Pasir Malap, in forest on riverbank, alt. 20 m, May 14: *n. 3012* (nat. n.: *ála'oewàn'a*).

Distribution: Celebes, Philippines, Talaud, Moluccas, New Guinea.

Rhaphidophora Korthalsii Schott, Ann. Mus. Lugd.-Bat. 1, 1863, 129.

Karakelong, Loc. 1, Pasir Malap, riverbank, May 14: *n. 3019* (nat. n.: *timàs'a*).

Distribution: Malay Peninsula, Java, Borneo, Talaud.

Scindapsus Cuscuaria (Aubl.) Presl, Epimel., 1849, 242.

Karakelong, Loc. 2, old forest, alt. 250 m, May 8: *n. 2899* (climbing high; nat. n.: *ára'oewàn'a*).

Distribution: Sumatra, Java, Talaud, Ambon.

FLAGELLARIACEAE

Flagellaria indica L., Sp. Pl., 1753, 333.

Karakelong, Loc. 2, fairly frequent in old forest, alt. 250 m, May 10: *n. 2935* (flow. whitish yellow; nat. n.: *oewàt'a*) — Loc. 7, G. Piapi, open slope, 450 m, May 31: *n. 3244* (protandrous; nat. n.: *oewàk'a*) — Salebaboe, Loc. 3, very frequent in old forest, alt. 260 m, May 23: *n. 3134* (long liana; nat. n.: *oewàk'a*).

Morotai, Loc. 12, Marilako, frequent on riverbank, June 28: *n. 3642* (liana, 10 m long; nat. n.: *róma*).

Distribution: paleotropic.

COMMELINACEAE

Aclisia sorzogonensis E. Mey. in Presl, Rel. Haenk. 1, 1827, 138, t. 25.

Karakelong, Loc. 1, swampy place, alt. 20 m, April 25: *n. 2599* (large herb, lvs. l. green, calyx and style white, ovary l. green; nat. n.: *bambaráwan*) — Loc. 2, on recent landslide, alt. 50 m, May 11: *n. 2947* (herb, stem prostrate and rooting, top curved upward, lvs. l. green, calyx, corolla, stamens and pistil white, fr. d. greyish blue; nat. n.: *pamparáwan'a*) — Salebaboe, Loc. 3, G. Ajambana, old forest, alt. 320 m, May 23: *n. 3139* (same annotations as n. 2947, no fruits) — Miangas, Loc. 9, shady place on hillslope, alt. 5 m, June 11: *n. 3360* (same annotations as n. 2947, filaments and ovary greenish white, anthers yellow, fr. green when young, black with age).

Morotai, Loc. 12, Goegoeti, cleared grounds along riverbank, alt. 40 m, June 23: *n. 3574* (same annotations as n. 2947, herb to 2 m high, fr. d. violet-brown).

Distribution: India and S. China to Polynesia.

Aneilema vitiense Seem., Fl. Vit., 1865—'73, 314, t. 96.

Karakelong, Loc. 1, cleared old forest, alt. 90 m, April 26: *n. 2633* (herb, slightly succulent, l. green, corolla white, ovary l. green, fr. green).

Distribution: N. Celebes, Philippines, Talaud, Moluccas (Ternate, Batjan, Ambon), Kai Islands, Timor, New Guinea, Micronesia, Polynesia.

Commelina nudiflora L., Sp. Pl., 1753, 4.

Karakelong, Loc. 1, in coconut plantation, alt. 100 m, April 25: *n. 2595* (herb, partly prostrate, lvs. l. green, calyx very l. green, corolla bright blue; nat. n.: *sampadóéri*).

Distribution: pantropic.

Cyanotis axillaris (L.) D. Don, Prodr. Fl. Nepal, 1825, 46.

Karakelong, Loc. 1, alang-alang field, alt. 100 m, April 25: *n. 2592* (herb, partly prostrate, lvs. l. green, slightly violet below, calyx l. green, corolla l. violet, internodes at base of the plant wine red, at the top l. green; nat. n.: *borontimóék'a*).

Distribution: India and China to Australia.

Floscopa scandens Lour., Fl. For. Cochinch., 1790, 193.

Karakelong, Loc. 1, open sec. forest, alt. 15 m, April 25: *n. 2602* (herb, lvs. bright green, calyx greenish white, corolla l. violet, ovary l. green; nat. n.: *sampadóéri*).

Distribution: India and China to Australia.

LILIACEAE

Dianella coerulea Sims, Curt. Bot. Mag. 15, 1801, 505.

Karakelong, Loc. 7, G. Piapi, sunny slope, 400 m alt., May 31: *n. 3245* (calyx and corolla blue, filaments white, anthers yellow, style white, fr. d. blue-green; nat. n.: *marióéoe*).

Distribution: Philippines, Talaud, New Guinea to Fiji, New Caledonia and N. Australia.

Smilax zeylanica L., Sp. Pl., 1753, 1029.

Salebaboe, Loc. 3, frequent in old forest, alt. 260 m, May 22: *n. 3108* (long climbing; nat. n.: *sarâwat'oe *wáwi*).

Distribution: Madagascar?, India to New Guinea (not known from the Philippines).

AMARYLLIDACEAE

Crinum asiaticum L., Sp. Pl., 1753, 292.

Karakelong, Loc. 1, on the beach, April 23: *n. 2518* (herb, 2 m, flow. fragrant; nat. n.: *garòhom'a*).

Distribution: India and Polynesia.

Curculigo capitulata (Lour.) O. Ktze, Rev. Gen. Pl., 1891, 703.

Salebaboe, Loc. 3, frequent in sec. forest, 200 m alt., May 24: *n. 3158* (terrestrial, flow. yellow).

Morotai, Loc. 12, Goegoeti, frequent in old forest, 40 m alt., June 26: *n. 3626* (nat. n.: *pòpóko*).

Distribution: India and S. China to N. Australia.

TACCACEAE

Tacca leontopetaloides (L.) Baill., Hist. Pl. 13, 1894, 169.

Karakelong, Loc. 1, coastal forest, alt. 1 m, April 23: *n. 2519* (herb, 2.4 m high, lvs., corolla and calyx green, anthers white, fr. d. green) — Miangas, Loc. 9, behind the beach, alt. 2 m, June 12: *n. 3405* (herb, lvs. d. green, nerves and petioles greenish white, calyx green, corolla l. green, filaments brown, l. green at base, anthers, style and stigma white, fr. d. green, tuber brown; nat. n.: *anoewoe*).

Distribution: paleotropic.

Tacca palmata Bl., Enum., 1827, 83.

Kaboeroeang, Loc. 5, sec. forest, alt. 150 m, May 27: *n. 3206* (lvs. l. green, petiole and stem dirty green, fr. bright red, green when young, tuber white) — Miangas, Loc. 9, G. Kota, small grove, alt. 90 m, June 11: *n. 3390* (herb, same annotations as n. 3206, corolla dirty yellow, anthers l. dirty yellow, stigma white, margin violet).

Distribution: Sumatra, Java, Borneo, Celebes, Philippines, Talaud, Timor, Micronesia.

DIOSCOREACEAE

Dioscorea oppositifolia L., Sp. Pl., 1753, 1033.

Karakelong, Loc. 1, sec. forest, alt. 60 m, April 24: *n. 2544* (nat. n.: *saràpat'a*).

Distribution: India to Moluccas (not known from Philippines).

ZINGIBERACEAE

Alpinia malaccensis (Burm.) Roscoe, Trans. Linn. Soc. 8, 1808, 345.

Morotai, Loc. 12, Marilako, on cleared grounds, June 29: *n. 3668* (herb, 2.5 m, flow. white, lip with yellow margin and red basis).

Distribution: India, Malay Peninsula, Sumatra, Java, Moluccas (Morotai, Ceram).

Alpinia pectinata Ridl. (ined. ?).

Karakelong, Loc. 1, very frequent in sec. forest, April 25: *n. 2584* (infl. stiffly curved downward, flow. white, fr. pink; nat. n.: *peòtah*) — Loc. 2: *n. 2808* (same annotations and nat. n.).

Distribution: Talaud, Celebes.

Remarks: These specimens were not seen by us. The identification was made at Buitenzorg but the name *Alpinia pectinata* is not to be found in the Index Kewensis. Yet, the species is mentioned since it is one of the most frequent plants in secondary vegetations.

Alpinia pubiflora (Benth.) K. Schum. in Engl., Pflanzenr. 20, 1904, 313.

Karakelong, Loc. 1, sec. forest, alt. 2 m, April 23: *n. 2517* (flow. white, lip purple); sec. forest, alt. 60 m, April 24: *n. 2548* (herb, 2.5 m, flow. dirty white, lip lilac, fr. dull red; nat. n.: *tentáiris*).

Distribution: Mindanao, Talaud, New Guinea, Carolines.

Amomum roseum (T. & B.) Benth. & Hook. f., Gen. Pl. 3, 1883, 644.

Karakelong, Loc. 1, very frequent in cleared forest, alt. 30 m, April 25: *n. 2588* (herb, 6 m, flow. white; nat. n.: *anàm'a*); alt. 100 m, April 26: *n. 2631* (same nat. n.) — Loc. 2, riverbank, May 2: *n. 2972* (same nat. n.) — Salebaboe, Loc. 3, very frequent in old forest, 220 m alt., May 22: *n. 3114* (herb, 2.5 m, flow. l. pink; nat. n.: *anàm'a*).

Distribution: Celebes, Talaud, Ternate, Ambon.

Costus speciosus (Koen.) Sm., Trans. Linn. Soc. 1, 1800, 249.

Karakelong, Loc. 1, sec. forest, alt. 8 m, April 24: *n. 2555* (herb, 3 m, flow. white; nat. n.: *tentajàsoe*).

Morotai, Loc. 12, cleared grounds on riverbank, alt. 40 m, June 23: *n. 3577* (herb, 4 m, flow. white, fr. red; nat. n.: *óéga-óéga*).

Distribution: Malay Peninsula to Micronesia.

Riedelia curviflora Oliv. in Hooker, Ic. Pl., 1883, t. 1419.

Karakelong, Loc. 1, sec. forest, 100 m alt., April 27: *n. 2644* (herb, 3.2 m, flow. white; nat. n.: *randóéloeng*) — Loc. 2, very frequent in forest on riverbank, alt. 50 m, May 1: *n. 2726* (nat. n.: *dendóéloeng*).

Distribution: Talaud, Moluccas (Boeroe, Ceram, Ambon, Aroe), New Guinea, Solomon Isl.

MARANTACEAE

Donax canniformis (Forst. f.) K. Schum., Bot. Jahrb. 15, 1893, 440.

Salebaboe, Loc. 3, G. Ajambana, fairly frequent in sec. forest, alt. 180 m, May 20: *n. 3061* (herb, to 2 m high, lvs. bright green, above, paler below, calyx, pedicels and corolla white, fr. l. green when young, greenish white with age, pendulous; nat. n.: *bawambánan'a*).

Morotai, Loc. 12, very frequent in old forest, in moist places, alt. 20 m, June 29: *n. 3669* (strongly branched herb, to 4 m high, same annotations as n. 3061, lip slightly violet; nat. n.: *biáwa*).

Distribution: Java, Borneo, Celebes, Formosa, Philippines, Talaud, Moluccas, Micronesia, New Guinea, Bismarck Archipelago and Solomon Islands.

ORCHIDACEAE (J. J. Smith)

Appendicula reflexa Bl., Bijdr., 1825, 301; J. J. Smith, Bull. Jard. bot. Buit. Sér. III, 11, 1930, 73.

Karakelong, Loc. 2, in old forest, alt. 50 m, May 4: *n. 2832* (epiphytic, lvs. bright green, vagina l. green, thick coriaceous, flow. entirely greenish white, column l. green) — Loc. 7, G. Piapi, in light forest, alt. 350 m, June 2: *n. 3326* (same annotations as n. 2832).

Distribution: Malay Peninsula, Sumatra, Java, Borneo, Celebes, Talaud, Moluccas, New Guinea, Micronesia.

Calanthe veratrifolia R. Br., Bot. Reg. 9, 1823, t. 271.

Var. **lancipetala** J. J. Smith, l.c. 1930, 74.

Karakelong, Loc. 2, in old forest on narrow ridge, alt. 150 m, April 30: *n. 2689* (terrestrial, flow. white, base of lip l. yellow).

Distribution of the variety: endemic; of the species: India to Philippines and New Guinea.

Calymnanthera prob. **paniculata** (J. J. S.) Schlecht., Orch. D. N. Guin., 1913, 955; J. J. Smith, l.c. 1930, 80.

Morotai, Loc. 12, old forest, alt. 60 m, June 21: *n. 3501.*

Distribution: Morotai, New Guinea.

Dendrobium dimorphum J. J. Smith, l.c. 1930, 75.

Karakelong, Loc. 7, G. Piapi, on open summit under shrubs, alt. 500 m, June 2: *n. 3327* (terrestrial, flow. white; nat. n.: **bóésa'oe palián*).

Distribution: endemic.

Remark: Closely related to *D. paucilaciniatum* J. J. S. from Ternate.

Dendrobium hydrophilum J. J. Smith, Bull. Dépt. Agr. Ind. néerl. 19, 1908, 17.

Var. **morotaiense** J. J. Smith, Bull. Jard. bot. Buit., Sér. III, 11, 1930, 75.

Morotai, Loc. 12, in old forest, alt. 60 m, June 22: *n. 3553* (epiphytic, flow. white).

Distribution: of the variety: endemic; of the species: Morotai, New Guinea.

Dendrobium prob. **Koordersii** J. J. Smith, Orch. amb., 1905, 67 and l.c. 1930, 77.

Morotai, Loc. 12, living plant n. 18, cult. in Hort. Bog. sub *n. 133.*

Distribution: Celebes, Ambon, Soela-besi, Morotai.

Dendrobium lancifolium A. Rich., Sert. Astrol., 1834, 20, t. 8; J. J. Smith, l.c. 1930, 80.

Karakelong, Loc. 7, G. Piapi, open sunny slope, under shrubs, alt. 350 m, May 31: *n. 3242* (terrestrial, flow. white with violet tips, petals and lip violet striped and spotted; nat. n.: **oewak'oe piápi*).

Distribution: Celebes, Talaud, Moluccas.

Dendrobium Mirbelianum Gaud., Voy. Freyc. Bot., 1826, 423, t. 38; J. J. Smith, l.c. 1930, 77.

Karakelong, Loc. 1, in coastal forest on *Sonneratia,* sea level, April 23: *n. 2509* (epiphytic, flow. yellow with faint violet-brown stripes).

Distribution: Talaud, Moluccas, New Guinea.

Dendrobium quadrialatum J. J. Smith, Bull. Jard. bot. Buit., Sér. III, 5, 1922, 87 and 11, 1930, 78.

Morotai, Loc. 12, old forest, alt. 100 m, June 21: *n. 3522* (epiphytic, flow. pink, lip red with green basis, column and ovary green).

Distribution: Morotai, Ternate, Tidore, New Guinea.

Dendrobium talaudense J. J. Smith, l.c. 1930, 78.

Salebaboe, Loc. 3, G. Ajambana, old forest, alt. 260 m, May 23: *n. 3154* (epiphytic, flow. white with blue tips, ovary white).

Distribution: endemic.

Remark: Closely related to *D. molle* J. J. S. from New Guinea.

Dendrobium ternatense J. J. Smith, Bull. Dépt. Agric. Ind. néerl. 22, 1909, 26 and l.c. 1930, 77.

Morotai, Loc. 12, living plant n. 25, cult. in Hort. Bog. sub *n. 140.*

Distribution: Celebes, Philippines (Luzon), Moluccas (Morotai, Ternate, Tidore).

Didymoplexis minor J. J. Smith, Bull. Inst. Bot. Buit. 7, 1900, 1.

Var. **salmonea** J. J. Smith, Bull. Jard. bot. Buit., Sér. III, 11, 1930, 68.

Karakelong, Loc. 2, Pasir Malap, old forest along K. Bahewa, alt. 50 m, May 13: *n. 2994* (terrestrial, saprophytic) — Salebaboe, Loc. 3, G. Ajambana, old forest, alt. 250 m, May 22: *n. 3112* (saprophytic).

Distribution of the variety: endemic; of the species: Java, Talaud, Ambon.

Epipogum roseum (D. Don.) Lindl., Journ. Linn. Soc. 1, 1857, 177; J. J. Smith, l.c. 1930, 68.

Karakelong, Loc. 2, in forest on flat riverbank, alt. 50 m, May 1: *n. 2711* (terrestrial, saprophytic, entire plant white); old forest on slope, alt. 50 m, May 4: *n. 2838* (same annotations, lip of flower with some violet spots).

Distribution: paleotropic except in Polynesia.

Eria oligotricha Schlecht. & Laut., Nachtr. Fl. D. Schutzgeb. Südsee, 1905, 181; J. J. Smith, l.c. 1930, 75.

Karakelong, Loc. 2, old forest, alt. 50 m, May 11: *n. 2949* (epiphytic, flow. dirty yellow).

Distribution: Talaud, Boeroe, New Guinea.

Eulophia squalida Lindl., Bot. Reg. 27, 1841, 77; J. J. Smith, l.c. 1930, 80.

Karakelong, Loc. 2, old forest on steep slope, 80 m alt., May 5: *n. 2842* (terrestrial, lvs. l. green, peduncle and bracts very light, flow. greenish white and dirty violet, column with white tip; nat. n.: **sasáwa'a*) — Salebaboe, Loc. 3, G. Ajambana, sec. forest, alt. 150 m, May 20: *n. 3063* (flow. dirty green-pink) — Kaboeroeang, Loc. 5, sec. forest, alt. 100 m, May 27: *n. 3208* (sepals l. green, petals white, lip dirty pink).

Distribution: Sumatra, Java, Borneo, Celebes, Philippines, Talaud, Moluccas.

Eulophia venosa (F. v. Muell.) Reichb. f., Fl. Austr. 6, 1873, 300; J. J. Smith, l.c. 1930, 80.

Karakelong, Loc. 2, east of Lobo, in alang-alang field, alt. 10 m, May 15: *n. 3027* (terrestrial, no lvs. extant, tuber white, stem l. green with greenish brown scales and l. green bracts, flow. white with violet stripes, lip green beneath, base of wings d. violet).

Distribution: Talaud, New Guinea, Australia.

Galeola Kuhlii (Reichb. f.) Reichb. f., Xen. Orch. 2, 1865, 78; J. J. Smith, l.c. 1930, 68.

Salebaboe, Loc. 3, G. Ajambana, old forest, alt. 250 m, May 25: *n. 3172* (terrestrial, saprophytic, flow. l. yellow).

Distribution: India, Malay Peninsula, Sumatra, Java, Philippines, Talaud.

Microstylis latifolia (Sm.) J. J. Smith, Fl. Buitenz. 6, 1905, 248, atl. fig. 185 and l.c. 1930, 70.

Salebaboe, Loc. 3, G. Ajambana, old forest, alt. 260 m, May 22: *n. 3119* (terrestrial, lvs. and fr. l. green).

Distribution: India to Philippines and Australia.

Microstylis purpureo-viridis J. J. Smith, l.c. 1930, 70.

Karakelong, Loc. 1, on rocks in side of ravine, cleared forest, alt. 40 m, April 25: *n. 2569* (flow. l. green) — Loc. 7, G. Piapi, in low forest, alt. 350 m, May 31: *n. 3239* (fr. violet).

Distribution: endemic.

Remarks: Closely related to some species from New Guinea (cf. Smith, l. c.). The species is abundant in all Talaud Islands, but n. 3239 was the only specimen found in flower at the time.

Microstylis talaudensis J. J. Smith, l.c. 1930, 71.

Karakelong, Loc. 2, border of recent landslide, alt. 50 m, May 11: *n. 2961* (terrestrial, flow. buds violet); Pasir Malap, in old forest on riverbank, alt. 20 m, May 15: *n. 3000* — Salebaboe, Loc. 3, G. Ajambana, cleared old forest, alt. 150 m, May 20: *n. 3065*.

Distribution: endemic.

Remark: Dr. Smith informs us that the nearest allies are *M. klabatensis* Schlecht. from N. Celebes and *M. seranensis* J. J. S. from Ceram.

Microstylis trigonopetala J. J. Smith, Nat. Tijdschr. N. I. 58, 1898, 358, pl. 4, fig. 1—3 and l.c. 1930, 69.

Karakelong, Loc. 7, G. Piapi, old forest, alt. 100 m, June 3: *n. 3339* (terrestrial, lvs., peduncle and bracts l. green, flow. l. yellow, column black at tip, ovary l. green) — Salebaboe, Loc. 2, G. Ajambana, cleared old forest, alt. 340 m, May 20: *n. 3066* (same annotations as n. 3339, but lip orange-yellow); alt. 260 m, May 23: *n. 3151* (same annotations as preceding nrs.).

Distribution: Celebes, Talaud.

Peristylus papuanus (Kraenzl.) J. J. Smith, Nova Guinea XII, 1913, 3 and l.c. 1930, 67.

Karakelong, Loc. 2, old forest, alt. 160 m, May 2: *n. 2746* (terrestrial).

Distribution: Talaud, Ceram, Ambon, New Guinea.

Podochilus Lamii J. J. Smith, l.c. 1930, 72.

Morotai, Loc. 12, old forest, alt. 40 m, June 20: *n. 3486* (epiphytic; nat. n.: *lolomíti*).

Distribution: endemic.

Remark: Closely related to *P. obovatipetalus* J. J. S. from Borneo.

Polystachya flavescens (Bl.) J. J. Smith, Fl. Buitenz. 6, 1905, 284, atl. fig. 218 and l.c. 1930, 73.

Karakelong, Loc. 7, G. Piapi, open sunny slope, alt. 400 m, June 3: *n. 3338* (epiphytic, lvs. dull green, fr. green).

Distribution: pantropic.

Spathoglottis plicata Bl., Bijdr., 1825, 401, Tab. fig. 76; J. J. Smith, l.c. 1930, 73.

Karakelong, Loc. 1, sec. forest, alt. 50 m, April 24: *n. 2543* (flow. lilac; nat. n.: *sa'ansáwa*) — Loc. 7, open sunny slope under shrubs, alt. 350 m, May 31: *n. 3251* (nat. n.: **sasáwa'a*) — Salebaboe, Loc. 3, G. Ajambana, along rivulet in cleared forest, alt. 200 m, May 22: *n. 3109* (nat. n.: **sasawá'an'a*) — Miangas, Loc. 9, in coconut plantation, alt. 5 m, June 12: *n. 3400.*

Distribution: Malay Peninsula to Formosa and Carolines.

Thelasis micrantha (Brongn.) J. J. Smith, Fl. Buitenz. 6, 1905, 495, atl. fig. 374 and l.c. 1930, 80.

Karakelong, Loc. 2, old forest, alt. 50 m, May 4: *n. 2831* (epiphytic, peduncle and flow. buds l. brown).

Distribution: Malay Peninsula, Sumatra, Java, Borneo, Philippines, Talaud.

Dicotyledoneae

PIPERACEAE

Piper abbreviatum Opiz in Presl, Rel. Haenk. 1, 1828, 157.

Karakelong, Loc. 1, cleared sec. forest, alt. 100 m, very frequent, April 26: *n. 2609* (climbing, several m long, lvs. bright green, nodes brownish, infl. l. green, yellow with age; nat. n.: *daràmang'kahoerángan'a*); cleared old forest, alt. 100 m, frequent, April 26: *n. 2610* (same annotations and nat. n.) — Salebaboe, Loc. 3, old forest, alt. 300 m, May 23: *n. 3150* (climbing, lvs. d. green above, paler below, ovary l. yellow, fr. l. green) — Kaboeroeang, Loc. 4, sec. forest, May 26: *n. 3198* (same annotations as n. 2609; nat. n.: *láling oe àsoe*).

Distribution: Sumatra, Java, Bali, Borneo, Celebes, Philippines, Talaud.

Piper amboinense (Miq.) C. DC., Prodr. 16, pt. 1, 1869, 347.

Morotai, Loc. 12, G. Ligòjer, old forest, alt. 50 m, June 27: *n. 3630* (climbing, several m long, lvs. d. green, paler below, nerves red when young, anthers l. yellow, ovary d. green; nat. n.: *táli*).

Distribution: N. Borneo, Celebes, Moluccas (Morotai, Ternate, Batjan, Boeroe, Ceram, Ambon), New Guinea.

Piper sarmentosum Roxb., Fl. Ind., ed. I, 1, 1820, 162.

Karakelong, Loc. 1, wayside, alt. 5 m, April 23: *n. 2498* (herb, many together, lvs. d. green, infl. white; nat. n.: *rimboàs'a*).

Distribution: India and S. China, Sumatra, Java, Borneo, Philippines, Talaud, Moluccas (Ternate, Ceram).

Piper villilimbum C. DC., Leafl. Philip. Bot. 3, 1910, 788 — *Piper Boerlagei* C. DC., Candollea 1, 1923, 226.

Morotai, Loc. 12, old forest, alt. 120 m, June 22: *n. 3555* (climbing, lvs. d. green above, paler below, fr. greenish brown).

Distribution: Philippines, Morotai, Ambon.

Remarks: *Piper villilimbum* and *Piper Boerlagei* cannot be considered specifically distinct. According to De Candolle, *P. villilimbum* should differ from *P. Boerlagei* by having the peduncles about as long as the petioles, whereas in the latter species they should be much longer than the petioles. In the specimens of both species at my disposal, including the type specimens, all peduncles are longer than the petioles, except in a specimen of *P. villilimbum*, in which the inflorescences were very young.

FAGACEAE

Castanopsis javanica (Bl.) A. DC., Journ. Bot. 1, 1863, 182.

Morotai, Loc. 12, old forest, 50 m alt., frequent, June 22: *n. 3536* (tree, 20 m; nat. n.: *híleh*).

Distribution: Malay Peninsula, Sumatra, Java, Borneo, Palawan, Mindanao, Morotai.

ULMACEAE

Celtis latifolia (Bl.) Planch. in DC., Prodr. 17, 1873, 186.

Morotai, Loc. 12, Marilako, frequent in old forest, 20 m alt., June 28: *n. 3635* (tree, 17 m, fr. green; nat. n.: *hóro*).

Distribution: Moluccas, New Guinea.

Gironniera celtidifolia Gaud., Bot. Freyc. Voy., 1844, t. 85.

Morotai, Loc. 12, old forest, 60 m alt., June 20: *n. 3466* (small tree, fr. green; nat. n.: *kòko*); G. Ligòjer, alt. 120 m, June 24: *n. 3586* (tree, 8 m, fr. l. green; same nat. n.).

Distribution: Philippines to Micronesia, Fiji and Samoa.

Trema amboinensis (Willd.) Bl., Mus. Bot. Lugd.-Bat. 2, 1856, 61.

Karakelong, Loc. 1, sec. forest, 60 m alt., April 24: *n. 2530* (tree, 4 m, fr. green; nat. n.: *mandalíroeng'a*; decoction of leaves used as a laxative) — Loc. 8, on native field, 10 m alt., June 3: *n. 3331* (same annotations and nat. n.).

Morotai, Loc. 12, Marilako, in cleared grounds, 20 m alt., June 29: *n. 3673* (shrub, 3 m, fr. greenish white).

Distribution: S.E. Asia to Carolines.

MORACEAE

Artocarpus communis Forst., Char. Gen., 1776, 101.

Karakelong, Loc. 2, frequent in old forest, alt. 250 m, May 8: *n. 2895* (tree, 17 m, latex abundant and sticky, used for catching birds; nat. n.: *tipóéroe*).

Distribution: Polynesia, New Guinea, Talaud, introduced and cultivated elsewhere. According to Merrill it is probably introduced in the Philippines. Both in New Guinea and in Talaud it is undoubtedly wild.

Artocarpus elastica Bl., Bijdr., 1825, 481.

Karakelong, Loc. 2, frequent in old forest, alt. 100 m, May 5: *n. 2845* (tree, 31 m, diam. 0.50 m, straight, buttresses small, latex copious, sticky; wood demanded for house construction; nat. n.: *awá'a*).

Distribution: Malay Peninsula to Philippines and Moluccas.

Artocarpus reticulata Miq., Ann. Mus. Bot. Lugd.-Bat. 3, 1867, 213.

Karakelong, Loc. 1, old forest, alt. 100 m, April 26: *n. 2626* (tree, 12 m, latex white; nat. n.: *língka oewíng'a*).

Distribution: Celebes, Talaud, Moluccas.

Conocephalus suaveolens Bl., Bijdr., 1825, 483.

Morotai, Loc. 12, Goegoeti, frequent on riverbank, 40 m alt., April 26: *n. 3620* (liana, 20 m long, infl. lilac; nat. n.: *dongòta*).

Distribution: India and Malaysia.

Fatoua pilosa Gaud., Bot. Freyc. Voy., 1826, 509.

Karakelong, Loc. 8, wayside, June 4: *n. 3343* (small shrub, petioles reddish, calyx l. green, stamens and style white, fr. l. green; decoction of roots used against enteric diseases; nat. n.: *áloe'mparánoh*) — Kaboeroeang, Loc. 4, waysides, May 26: *n. 3195* (undershrub, stem l. brown, lvs. bright green, l. green below, petioles brownish green, calyx l. green, corolla white, style greenish white; nat. n.: *maróéloem'a*).

Distribution: S.E. Asia and Malaysia.

Ficus ampelas Burm. f., Fl. Ind., 1768, 226.

Kaboeroeang, Loc. 4, sec. forest, May 26: *n. 3186* (tree, 4 m; nat. n.: *asimbóéroeng'a*) — Loc. 5, sec. forest, alt. 150 m, May 27: *n. 3202* (tree, 8 m, figs red; nat. n.: *asimbóéroeng'a*).

Distribution: Sumatra to Moluccas and Timor.

Ficus botryocarpa Miq., Ann. Mus. Bot. Lugd.-Bat. 3, 1867, 233.

Karakelong, Loc. 1, sec. forest, alt. 80 m, April 24: *n. 2528* (tree, 6 m, figs greenish brown on drooping branches inserted on trunk; nat. n.: *nóhnah*) — Loc. 2, old forest, alt. 40—50 m, May 3—4: *n. 2767, 2814* (both trees 10—13 m, same nat. n.).

Distribution: Talaud, Celebes.

Ficus Cassidyana Elm., Leafl. Phil. Bot. 1, 1906, 200.

Morotai, Loc. 12, Marilako, fairly frequent in old forest, 20 m alt., June 28: *n. 3649* (tree, 10 m, figs green; nat. n.: *gòjen*).

Distribution: Philippines, Morotai.

Ficus celebica Bl., Bijdr., 1825, 461.

Karakelong, Loc. 1, sec. forest, alt. 80 m, April 24: *n. 2538* (tree, 5 m, figs yellowish red; nat. n.: *atántas'a*).

Distribution: Malay Peninsula, Celebes, Philippines, Talaud, New Guinea.

Ficus falcata Thunb., Ficus, 1786, 8.

Morotai, Loc. 12, old forest, alt. 100 m, very frequent, June 22: *n. 3547* (climbing).

Distribution: Ceylon to Philippines and Moluccas.

Ficus heteropoda Miq., Ann. Mus. Bot. Lugd.-Bat. 3, 1867, 232.

Karakelong, Loc. 1, old forest, alt. 40 m, April 25: *n. 2581* (tree, 10 m, lvs. very rough, used for polishing ebony, figs almost white; nat. n.: *pàdeh*).

Distribution: Celebes, Philippines, Talaud, Halmahera.

Ficus ?kallicarpa Miq., Ann. Mus. Bot. Lugd.-Bat. 3, 1867, 268, t. 10 fig. A.

Miangas, Loc. 9, alt. 40 m, June 11: *n. 3353* (tree, 6 m, figs l. green; nat. n.: *péleh*).

Distribution: Malay Peninsula, Sumatra, Borneo, Celebes, Miangas.

Ficus ?lanata Bl., Bijdr., 1825, 441.

Karakelong, Loc. 2, old forest, alt. 70 m, May 5: *n. 2843* (climbing, figs orange-coloured; nat. n.: *língka oewíng'a*).

Distribution: Sumatra, Java, Talaud.

Ficus leucantatoma Poir., Enc. Bot., Suppl. 2, 1813, 654.

Karakelong, Loc. 1, sec. forest, alt. 50 m, April 24: *n. 2532* (tree, 6 m, nerves white, figs l. green; nat. n.: *boeàs'a*) — Miangas, Loc. 9, behind the beach: *n. 3407* (nat. n.: *póéwah*).

Distribution: S. China and Malay Peninsula to Celebes, Moluccas and Timor. Probably conspecific with *F. hauili* Blanco from the Philippines.

Ficus Minahassae (Teysm. & De Vr.) Miq., Ann. Mus. Bot. Lugd.-Bat. 3, 1867, 231, 296.

Karakelong, Loc. 2, very frequent in old forest on riverbank, alt. 50 m, May 1: *n. 2733* (tree, 21 m high, bole 7.6 m, straight, cylindrical, d. brown, diam. 0.4—0.2 m, lvs. d. green above, l. green below, petioles and nerves l. green, figs clustered along ± 5 m long leafless branches, which hang down from the trunk, those which sprout forth from the base of the trunk, lie down in great masses on the ground, these branches red when young, turning reddish brown with yellow lenticels, milky juice abundant, sticky when drying up, precipitating at the chopping wounds, from which only the water is trickling down; nat. n.: *rinít'a*) — Salebaboe, Loc. 3, frequent in sec. forest, north of G. Ajambana, alt. 200 m, May 24: *n. 3157* (fig carrying branches with some reduced leaves; nat. n.: *rinít'a*).

Distribution: N. Celebes, Talaud, Philippines.

Ficus procera Bl., Bijdr., 1825, 445.

Karakelong, Loc. 1, beach, April 23: *n. 2488* (large tree with low drooping branches, figs greenish yellow; nat. n.: *nóénoe'a*) — Loc. 2, old forest, alt. 150 m, May 11: *n. 2941* (tree, 45 m, diam. 1.40 m, buttresses very large, trunk furrowed, latex copious; same nat. n.).

Distribution: Malay Peninsula, Sumatra, Java, Talaud, Moluccas (Obi).

Ficus pubinervis Bl., Bijdr., 1825, 452.

Karakelong, Loc. 1, old forest, alt. 100 m, April 26: *n. 2627* (tree, 11 m, figs l. green; nat. n.: *lariasàn'oe *paní'i*).

Distribution: Japan, Sumatra, Java, Borneo, Celebes, Philippines, Talaud, Timor.

Ficus recurva Bl., Bijdr., 1825, 457.

Karakelong, Loc. 2, old forest, alt. 250 m, May 8: *n. 2907* (liana, figs dull d. red, latex little, nat. n.: *larímoe oeràn'a*).

Distribution: Malay Peninsula, Sumatra, Java, Borneo, Philippines (Palawan, Leyte), Talaud, Moluccas (Ternate).

Ficus retusa L., Mant. 1, 1787, 129.

Miangas, Loc. 9, frequent in small grove, alt. 90 m, June 11: *n. 3384* (tree, 10 m, figs l. green; nat. n.: *panambóéri*).

Distribution: India and S. China to Australia.

Ficus rudis Miq., Ann. Mus. Bot. Lugd.-Bat. 2, 1865—1866, 222, 291.

Karakelong, Loc. 1, in cleared forest, alt. 40 m, April 25: *n. 2585* (tree, 15 m, figs l. green, nat. n.: *ambíra*).

Distribution: Celebes, Philippines (Mindanao, Negros), Talaud, Moluccas (Ceram, Ambon, Banda).

Ficus subulata Bl., Bijdr., 1825, 461.

Karakelong, Loc. 2, on riverbank in old forest, alt. 50 m, May 3: *n. 2782* (tree, 7 m, figs l. greenish yellow; nat. n.: *pàdeh *ahoerángan*) — Salebaboe, Loc. 3, frequent in sec. forest, alt. 50 m, May 21: *n. 3071* (tree, 12 m, figs bright yellow; nat. n.: *pèlèta*).

Distribution: India and S. China to Formosa, Philippines, Moluccas and New Guinea.

Ficus variegata Bl., Bijdr., 1825, 459.

Karakelong, Loc. 2, fairly frequent in old forest, alt. 200 m, May 10: *n. 2922* (tree, 30 m, diam. 0.70 m; nat. n.: *bíntas'a*).

Distribution: S. China and Malay Peninsula to Philippines, Moluccas and Soemba.

Vanieria cochinchinensis Lour., Fl. For. Cochinch., 1790, 565.

Karakelong, Loc. 2, old forest, alt. 150 m, May 11: *n. 2950* (long liana; nat .n.: *poendáneh*).

Distribution: E. Africa to Australia.

URTICACEAE

Boehmeria clidemoides Miq., Pl. Jungh., 1851—'55, 34.

Karakelong, Loc. 2, steep bank of K. Tatamboewe, alt. 40 m, May 3: *n. 2765* (shrub, some m high, lvs. bright green, paler below, nerves still paler, infl. l. green; nat. n.: *sòsop*).

Distribution: S. China, Sumatra, Java, Borneo, Talaud, Moluccas (Tidore).

Elatostema polioneurum Hall. f., Fedde's Repert. 2, 1906, 62; Schröter & Hub. Winkler, Fedde's Repert. Suppl. 83, 1935, 106.

Karakelong, Loc. 1, shady ravine in sec. forest, alt. 60 m, April 24: *n. 2553* (herb, 1.5 m high, lvs. d. green above, lighter beneath, flow. dirty white; nat. n.: *babíseh*); Loc. 2, bank of K. Bahewa, alt. 30 m, May 12: *n. 2965* (same annotations and nat. n.; flow. pink) — Salebaboe, Loc. 3, G. Ajambana, alt. 150 m, May 20: *n. 3056* (stems and petioles reddish, infl. very l. pink).

Distribution: N. Celebes, Talaud, Ambon.

Laportea amplissima Miq., Fl. Ind. Bat., pt. 2, 1855—'59, 232.

Morotai, Loc. 12, Goegoeti, on riverbank, alt. 40 m, June 26: *n. 3628* (tree, ± 4 m high, lvs. dull d. green above, bright green below, midrib l. green, petioles green, infl. l. green, slightly violet; nat. n.: *tatáoen*).

Distribution: Java, Bali, Celebes, Moluccas (Morotai, Halmahera, Ternate, Boeroe, Ceram, Ambon).

Leucosyke capitellata (Poir.) Wedd. in DC., Prodr. 16, 1869, 235.

Karakelong, Loc. 1, sec. forest, 10 m alt., April 23: *n. 2501* (large shrub, 4 m; nat. n.: *barabíran'a*); wayside, 100 m alt., April 26: *n. 2608* (lvs. white underneath; same nat. n.) — Loc. 2, old forest, 250 m alt., frequent: *n. 2904* (tree, 13 m; same nat. n.; bast used for making ropes).

Distribution: Formosa and Java to New Guinea.

Maoutia Puya Wedd., Arch. Mus. Hist. Nat. Par. 9, 1856—1857, 477, t. 16B.

Karakelong, Loc. 2, steep riverbank, alt. 50 m, May 3: *n. 2763* (shrub, infl. very l. green; nat. n.: *sòsop*).

Distribution: India to Celebes, Moluccas and Timor.

Pipturus argenteus (Forst. f.) Wedd. in DC., Prodr. 16, 1869, 235.

Miangas, Loc. 9, behind the beach, alt. 2 m, June 12: *n. 3404* (shrub, ± 1 m high, lvs. bright green, l. green below, infl. l. green; nat. n.: *dendómeh*).

Distribution: Sumatra, Borneo and Philippines to Polynesia.

Pipturus incanus (Bl.) Wedd., in DC., Prodr. 16, 1869, 235.

Karakelong, Loc. 2, bank of K. Tatamboewe, old forest, alt. 50 m, May 3: *n. 2783* (tree, ± 9 m high, lvs. d. green above, l. green below, infl. l. green, fr. fleshy, white; nat. n.: *sòsop *ahoerángan*).

Distribution: Sumatra to Polynesia.

Pipturus velutinus Wedd., Ann. Sci. Nat. Bot., Sér. IV, 1, 1854, 196.

Morotai, Loc. 12, Goegoeti, cleared grounds along river, alt. 40 m, June 25: *n. 3610* (tree, ± 6 m high, lvs. d. green above, very l. green below, petioles l. green, style white, fr. fleshy, white, green when young; nat. n.: *libériën*).

Distribution: Mascarenes to Polynesia.

Pouzolzia zeylanica (L.) Benn., Pl. Jav. Rar., 1838, 67.

Salebaboe, Loc. 3, southwest of Liroeng, sec. forest, alt. 100 m, May 20: *n. 3050* (herb, lvs. bright green, paler below, petioles and stem slightly reddish, fr. l. green, red when young); same locality and date: *n. 3051* (same annotations as n. 3050, infl. l. green, no fr.).

Distribution: India to Philippines, Micronesia, New Guinea and Australia.

Pseudopipturus repandus (Bl.) Skottsb., Meddel. Göteb. Bot. Trädg. VIII, 1933, 117 — *Pipturus repandus* (Bl.) Wedd., Arch. Mus. Par. 9, 1856, 448.

Karakelong, Loc. 1, cleared forest, alt. 40 m, April 25: *n. 2583* (climbing, lvs. bright green, nerves red below, infl. l. green).

Distribution: Sumatra, Java, Celebes, Philippines, Talaud, Moluccas (Ternate, Boeroe, Ceram, Ambon, Banda), New Ireland, Micronesia.

Villebrunea rubescens (Bl.) Bl., Mus. Bot. Lugd.-Bat. 2, 1856, 167.

Karakelong, Loc. 2, old forest on riverbank, alt. 50 m, May 1: *n. 2720* (tree, 10 m high, bole 4 m, diam. 0.14—0.12 m, lvs. d. green, paler below, petioles brown, infl. very l. yellow; nat. n.: *ambíra*); same locality, May 3: *n. 2810* (small curved tree, ± 5 m high, branchlets brown, fr. green, fleshy white; nat. n.: *boeralá'a*) — Saleb aboe, Loc. 3, south of Liroeng, cleared old forest, alt. 100 m, May 21: *n. 3077* (small tree, ± 8 m high, perianth whitish green, filaments white, anthers brownish white).

Distribution: Java, Celebes, Philippines, Talaud, Moluccas.

LORANTHACEAE (B. H. Danser)

Amyema celebica (Van Tiegh.) Dans., Bull. Jard. bot. Buit., Sér. III, 10, 1929, 294 and 11, 1931, 328, fig. 9, o—p.

Karakelong, Loc. 1, forest along wayside, alt. 120 m, April 27: *n. 2648* (lvs. bright green, calyx and pedicels l. green, corolla red, the upper one third greenish yellow; nat. n.: **araràn'a*) — Loc. 2, in old forest, alt. 100 m, April 30: *n. 2692* (same annotations and nat. n. as n. 2648) — Loc. 7, G. Piapi, open sunny slope, alt. 400 m, May 31: *n. 3253* (same annotations and nat. n., fr. greenish white, branchlets grey).

Distribution: Celebes, Talaud, Philippines (Negros, Mindanao).

Amyema rigidiflora (Krause) Dans., l.c. 10, 1929, 298 and 11, 1931, 344, fig. 12, d—f.

Karakelong, Loc. 2, old forest, alt. 250 m, May 8: *n. 2908* (lvs. coriaceous, calyx and pedicels l. green, corolla orange-coloured, the tips of the petals yellowish green, fr. green with a red apex; nat. n.: **araràn'a késat'a*).

Distribution: Talaud, New Guinea.

Amylotheca stenopetala (Oliv.) Dans., l.c. 10, 1929, 302 and 11, 1931, 248, fig. 1, e—f.

Karakelong, Loc. 2, old forest, alt. 50 m, May 4: *n. 2815* (lvs. coriaceous, calyx l. green, corolla orange-coloured at base, yellowish green in the middle, tips d. red, fr. green).

Distribution: Flores, Salajar, Celebes, Talaud.

Dicymanthes hexameres Dans., l.c. 11, 1931, 364, fig. 16, h—k.

Morotai, Loc. 12, Goegoeti, on riverbank, alt. 40 m, June 26: *n. 3621* (on *Eugenia ? acutangula*, n. 3616, calyx l. green, corolla tube bright red, petals white, tips green, stamens and style red, stigma dirty yellow).

Distribution: endemic; the area of the genus is Philippines, Celebes, Moluccas, Lesser Sunda Islands, East-Java. The centre is in the Philippines.

Ginalloa Arnottiana Korth., Verh. Batav. Gen. 17, 1839, 260; Danser, l.c. 11, 1931, 449, fig. 24b.

Karakelong, Loc. 1, in cleared old forest, alt. 60 m, April 25: *n. 2562* (lvs. d. green, fr. green); cleared old forest, alt. 100 m, April 26: *n. 2613* (infl. l. green) — Loc. 2, old forest, alt. 170 m, May 7: *n. 2887* (fr. fleshy, salmon coloured, infl. l. green) — Loc. 7, G. Piapi, low forest on summit, alt. 500 m, June 1: *n. 3290* (infl. yellowish green).

Distribution: Borneo, Philippines (Luzon, Polillo, Negros), Talaud, Soelabesi, Lombok. The genus occurs from Burma and Indo China to the Philippines and the Moluccas.

Scurrula fusca (Bl.) G. Don, Gen. Hist. 3, 1834, 421; Danser, l.c. 11, 1931, 434.

Karakelong, Loc. 1, open sec. forest, alt. 20 m, April 25: *n. 2563* (on *Commersonia Bartramia* Merr., branchlets brown, lvs. l. green, young ones brown pubescent as is the flower, filaments and style d. red, anthers and stigma yellowish red; nat. n.: **araràn'a*) — Salebaboe, Loc. 3, G. Ajambana, in sec. forest, alt. 220 m, May 23: *n. 3138* (branchlets greyish brown, flow. greenish yellowish brown, filaments d. red, anthers pink, style and stigma red, ovary l. green; nat. n.: **araràn'a*).

Distribution: Malay Peninsula to Philippines, Talaud and Moluccas (Boeroe).

OPILIACEAE

Champereia manillana (Bl.) Merr., Phil. Journ. Sci. Bot. 7, 1912, 233.

Salebaboe, Loc. 3, sec. forest, alt. 150 m, frequent, May 24: *n. 3162* (tree, 11 m high; nat. n.: **amaloeàn'a*) — Nenoesa, Loc. 10, Merampi, sec. forest on limestone, alt. 100 m, June 13: *n. 3419* (flow. green; nat. n.: *aramáloe*).

Distribution: Burma to Philippines, Moluccas and Timor.

OLACACEAE

Erythropalum scandens Bl., Bijdr., 1825, 921.

Karakelong, Loc. 2, old forest, alt. 50 m, May 3: *n. 2806* (liana, 20 m, fr. red).

Distribution: S.E. Asia, Malay Peninsula, Sumatra, Java, Borneo, Philippines, Talaud.

Strombosia philippinensis (Baill.) Rolfe, Journ. Bot. 23, 1885, 211.

Kaboeroeang, Loc. 4, cleared old forest, alt. 75 m, very frequent, May 26: *n. 3175* (tree, 21 m, flow. l. green; nat. n.: *la'abóéoe*).

Distribution: Philippines, Talaud.

Ximenia americana L., Sp. Pl., 1753, 1193.

Karakelong, Loc. 1, behind the beach, April 23: *n. 2508* (flow. greenish yellow; nat. n.: **marimbòs'a*).

Distribution: pantropic.

POLYGONACEAE (B. H. Danser)

Polygonum minus Huds., Fl. Angl., 1762, 148.

Subspec. **procerum** Dans., Bull. Jard. bot. Buit., Sér. III, 8, 1926, 176.

Salebaboe, Loc. 3, Danon Timbalang'a, bank of small lake, alt. 250 m, May 24: *n. 3159* (herb, growing consociately, lvs. pretty d. green above, l. green below, midrib paler, flow. white with l. green base; nat. n.: *bángoen'a*) — Loc. 6, Lota swamp, alt. 5 m, May 28: *n. 3216* (herb, stem prostrate, rooting, lower ochreae brown, flow. white).

Morotai, Loc. 12, Marilako, along river bank, alt. 20 m, June 28: *n. 3648* (herb, stem partly prostrate, further annotations as in preceding nrs.).

Distribution of the species: Europe, temperate and tropical Asia to Marianas, New Zealand and Australia; of the subspecies: Borneo, Celebes, Philippines, Talaud, Moluccas, New Guinea, New Ireland, Marianas.

AMARANTACEAE

Achyranthes aspera L., Sp. Pl., 1753, 204.

Nenoesa, Loc. 10, Merampi, near Dampoelis, in coconut plantation, alt. 3 m, June 13: *n. 3432* (herb, lvs. l. green, infl. l. green).

Distribution: pantropic.

Deeringia polysperma (Roxb.) Moq. in DC., Prodr. 13, 1849, 236.

Karakelong, Loc. 2, bank of K. Bahewa, alt. 40 m, May 4: *n. 2837* (undershrub, lvs. bright green, stem brownish green, calyx l. green, stigma greenish white, fr. green) — Salebaboe, Loc. 3, G. Ajambana, skirt of forest, alt. 200 m, May 20: *n. 3052* (shrub, lvs. dull green, calyx greenish white, ovary green, fr. green when young, white when ripe; nat. n.: **tengtaramiseán wawíne*).

Distribution: Malay Peninsula to Philippines and New Guinea.

NYCTAGINACEAE

Pisonia sylvestris Teysm. & Binn., Nat. Tijdschr. Ned.-Ind. 9, 1855, 349, 355.

Salebaboe, Loc. 6, beach, May 28: *n. 3228* (small tree; nat. n.: *boeràn'a*).

Distribution: Java, Bali, Kangean, Talaud, Moluccas.

Pisonia umbellifera (Forst.) Seem., Bonplandia 10, 1862, 154.

Karakelong, Loc. 1, sec. forest, alt. 60 m, April 24: *n. 2537* (from base strongly branched tree, 8 m, flow. l. yellowish green, extremely many along branches and stems; nat. n.: *noríng'a*) — Loc. 2, Pasir Malap, old forest on riverbank, alt. 20 m, May 14: *n. 3004* (tree, 7 m).

Distribution: Malay Peninsula and Formosa to Polynesia and Australia.

AIZOACEAE

Mollugo pentaphylla L., Sp. Pl., 1753, 89.

Salebaboe, Loc. 3, G. Ajambana, ladang, alt. 150 m, May 21: *n. 3083* (herb, stems more or less prostrate, lvs. and stems bright green, calyx green, corolla white).

Distribution: India to Japan, Philippines, New Guinea and Micronesia.

RANUNCULACEAE

Clematis aristata R. Br., Bot. Reg., 1815—'24, t. 238.

Karakelong, Loc. 1, sec. forest, alt. 60 m, April 24: *n. 2540* (twining, several m long, lvs. l. green, flow. l. greenish yellow, anthers l. yellow, with white tip; the stems are wound around the waist against lumbago; nat. n.: *laràteh*); skirt of sec. forest, alt. 5 m, April 28: *n. 2677* (entire plant pale green, lvs. slightly darker above than below, fr. very l. green, styles in the ripe fruit feather-shaped, almost white; nat. n.: *naówi*).

Distribution: Celebes, Talaud, Moluccas (Boeroe, Ceram, Ambon), Lesser Sunda Islands (Soemba, Timor), New Guinea, Australia, Tasmania, New Zealand, New Caledonia and Fiji.

MENISPERMACEAE

Arcangelisia flava (L.) Merr., Interpret. Herb. Amb., 1917, 222.

Kaboeroeang, Loc. 5, skirt of old forest, alt. 100 m, May 27: *n. 3203* (liana, several m long, stem contains a yellow liquid, lvs. d. green shining above, dull and paler below, petioles green, infl. l. green).

Distribution: Java, Borneo, Celebes, Philippines, Talaud, Moluccas (Halmahera, Batjan, Ambon), New Guinea.

Pericampylus glaucus (Lam.) Merr., Interpret. Herb. Amb., 1917, 219.

Karakelong, Loc. 1, sec. forest, alt. 80 m, April 24: *n. 2541* (twining, several m long, lvs. bluish green, paler below, calyx l. brownish green, corolla l. green, filaments l. greenish yellow, anthers l. brown, stigma d. violet, ovary l. green, fr. dull green when young, turning wine red, black when ripe; nat. n.: *talimbá'as*).

Distribution: India to Philippines and New Guinea.

Stephania cauliflora Becc., Malesia I, 1877, 155.

Karakelong, Loc. 1, sec. forest, alt. 100 m, April 27: *n. 2646* (twining, many m long; nat. n.: *talimbá'as'a*).

Distribution: Talaud, Celebes.

Stephania hernandiifolia (Willd.) Walp., Rep. 1, 1842, 96.

Karakelong, Loc. 1, behind the beach, April 23: *n. 2490* (flow. yellowish green) — Salebaboe, Loc. 3, wayside, alt. 2 m, May 5: *n. 3096* (twining, some m long, fr. orange-coloured; nat. n.: **ánoe'óése'a*).

Distribution: India and S. China to Australia (not known from the Philippines).

MAGNOLIACEAE

Elmerrillia ovalis (Miq.) Dandy, Kew Bull. 1927, 261.

Salebaboe, Loc. 3, G. Ajambana, old forest, alt. 320 m, May 23: *n. 3121* (tree, 13 m high, bole 5.5 m, diam. 0.35—0.33 m, trunk straight, cylindrical, l. greyish brown, lvs. bright green, twigs bright green; used for house and proa construction; nat. n.: *pongóéan'a*).

Distribution: Celebes, Talaud.

ANNONACEAE

Artabotrys macrantha Holth., nov. spec., *Fig. 3* (p. 182).

Frutex scandens, rami novelli tomentosi, ramuli folia et flores gerentes curvati, longiusculi, apice hamosi. *Folia* oblonga, glabra, chartacea, 10—26 × 6—10 cm, apice obtusa, breviter acuminata, basi lata, subabrupte acute contracta. *Flores* pro genere magni, circiter 5 cm longi, apice unci praeter hami angulum ramulum foliosum gerentem inserti; *sepala* 3, apice acuta, triangularia, extus pubescentia, intus tomentosa; *petala* 6 biseriata, 3 externa longiora, interna breviora, omnia flava, utrinque pubescentia, basi extus villosa, intus glabra. *Stamina* multa, parva, antherae quam filamenta triplo longiores. *Carpella* 8, stylo curvato et ovario glabro aequilongis. *Fructus* ignoti.

A *liana*, climbing to a height of about 20 m. Branches glabrous but for the younger parts, which are densely tawny pubescent, lenticels little conspicuous; lateral branches curved, bearing the leaves and the flowers, 9—13 cm long and 0.3—0.4 cm thick, ferruginously pubescent when young, ending by a flat hook, which is broadened at the angles, the first angle bearing the leafed branchlets, the second angle and the end of the hook the flowers; the leafed branchlets often pubescent, up to 10 cm long, with 3 or 4 *leaves*, which are alternate, bright green, glabrous, the young ones reddish brown when dry, densely covered with long ferruginous hairs, especially on the midrib and the nerves, soon glabrate, oblong, 10—26 cm long and 6—10 cm broad, rigidly chartaceous, apex shortly and bluntly acuminate, base broad, abruptly narrowed into the petiole, margins entire, midrib little prominent on either side, secondary nerves 8—9, ascending at an angle of about 50°; petioles short and stout, about 1 cm long and 0.4 cm thick, glabrous or pubescent, brownish with age. *Flowers* large for the genus, about 5 cm long, with a soapy odour, pedicels about 1.4 cm long and 0.2 cm thick, ferruginously pubescent; *sepals* 3, 1.2 cm long and 1 cm broad, triangular, with a rather acute apex, ferruginously pubescent outside, tomentose inside; *petals* 6 in two whorls, the outer ones longer, 3.5—4 cm long and about 2 cm broad, greenish yellow when young, bright pale yellow when adult, dark reddish brown in a dry state, densely covered with yellow hairs on either side, the base more densely pubescent than the rest of the petal without, glabrous within. *Stamens* numerous, inserted on a short broad axis of about 0.1 cm high, filaments 0.05 cm long, anthers 0.15 cm, pale yellow. *Carpels* 8, each surrounded by a ring of erect hairs, about 0.3 cm long, the style dirty white, curved, about as long and almost as thick as the glabrous carpel. *Fruits* unknown.

Karakelong, Loc. 2, Pasir Malap, old forest on riverbank, alt. 20 m, May 14: *n. 3003* (bast used as medicine for wounds; *type specimen*, L., dupl. Bz., nat. n.: *pòtòdára*).

Remarks: The present species is distinguished by the long curved branchlets and the large flowers. The genus is recorded from India to the Philippines and the Moluccas.

Canangium odoratum (Lam.) Baill., Journ. As. Soc. Beng. 61, 1892, 41.

Karakelong, Loc. 2, old forest, steep slope, alt. 200 m, May 6: *n. 2857* (large tree, 48 m high, bole 28 m, diam. 0.55—0.39 m, trunk straight, cylindrical, pale greyish brown, lvs. shining, d. green, lower surface and nerves paler, calyx and pedicels l. green, corolla l. yellow, anthers yellow, ovary d. green, flow. fragrant; nat. n.: *lalangíran'a*) — Salebaboe, Loc. 3, G. Ajambana, old forest, alt. 250 m, May 22: *n. 3104* (tree, 28 m high, bole 20 m, diam. 0.30—0.20 m, same annotations as n. 2857, but corolla yellowish green, anthers l. green, fr. d. green; nat. n.: *larangíran'a*).

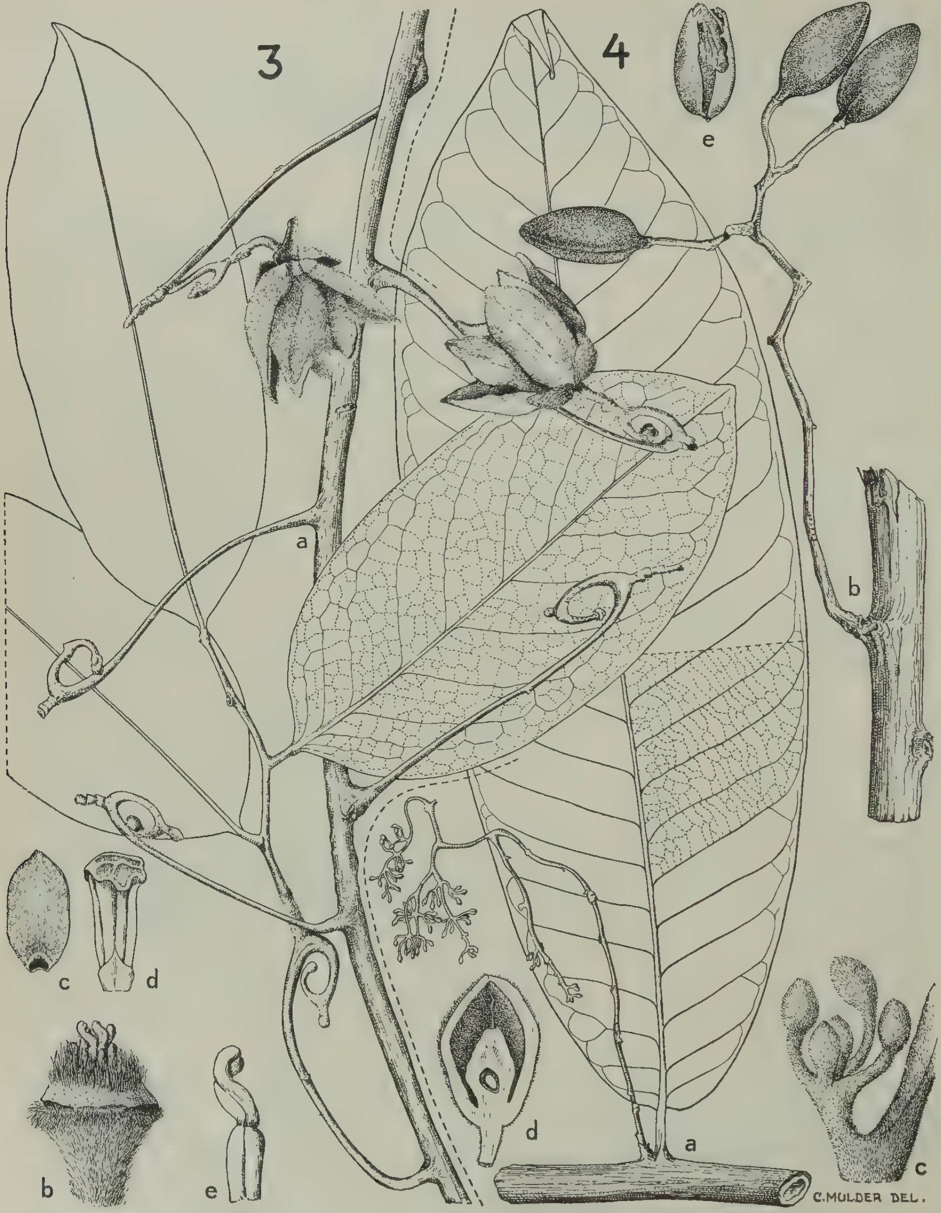

Fig. 3 — *Artabotrys macrantha* Holth., n. sp. — a. flowering branchlet; b. gynaeceum; c. petal, inside; d. stamen; e. carpel and style (after the *type specimen*).

Fig. 4 — *Gymnacranthera Ibutii* Holth., n. sp. — a. flowering branchlet; b. infrutescence; c. partial inflorescence with buds; d. female flower, longitudinal section; e. seed with arillus (after the *type specimen*).

Distribution: According to Merrill (Enum. Phil. Flow. Pl. 2, 1923, 158) this species is a native of Birma and Java and is introduced in many other tropical countries. The specimens from Karakelong and Salebaboe are undoubtedly wild.

Cyathocalyx ?acuminatus C. B. Rob., Bull. Torr. Bot. Club 35, 1908, 66, 74.

Karakelong, Loc. 2, old forest, alt. 70 m, May 2: *n. 2738* (tree, 15 m, flow. yellowish green, fr. green; nat. n.: *maniáoh*); old forest, alt. 180 m, May 10: *n. 2926* (tree, 18 m, same annotations; nat. n.: *atóéwoet'a*).

Distribution: Mindanao, Talaud.

Polyalthia celebica Miq., Ann. Mus. Bot. Lugd.-Bat. 2, 1865—1866, 14.

Karakelong, Loc. 2, old forest, alt. 70 m, May 4: *n. 2820* (tree, 11 m; nat. n.: *amiséan'a *batoe*).

Distribution: Celebes, Talaud.

Polyalthia lateriflora (Bl.) Kurz, Journ. As. Soc. Beng. 43, pt. 2, 1874, 52.

Morotai, Loc. 12, old forest, alt. 180 m, June 23: *n. 3565* (tree, 30 m, fr. orange-yellow; nat. n.: *harároko*).

Distribution: Malay Peninsula, Sumatra, Java, Borneo, Celebes, Morotai.

Uvaria purpurea Bl., Bijdr., 1825, 11.

Morotai, Loc. 12, old forest, June 20: *n. 3481* (liana, fr. l. yellow).

Distribution: S. China and Malay Peninsula to Lesser Sunda Islands, Moluccas and Philippines.

MYRISTICACEAE

Gymnacranthera Ibutii[1]) Holth., nov. spec., *Fig. 4* (p. 182).

Arbor mediocris. *Folia* chartacea, glabra, oblonga, 25—40 × 8—15 cm, apice acuto-acuminata, basi rotundata; petioli 1.5—2 cm longi. *Inflorescentiae femineae* late paniculatae usque ad 12 cm longae, multiflorae, ferrugineo-pubescentes, ebracteatae. *Alabastra* ovoidea, 0.2 cm longa, pedicellis circiter aequilongi, perigono 3-lobo, tepalis obtusis. *Fructus* elongato-ovoidei circiter 4 × 2 cm, arillus apice tantum laciniatus fulvus. Semina fusca. Planta masculina ignota.

Tree, about 17 m high, trunk cylindrical, brown with white spots, bole 11 m, diam. 0.24—0.09 m; branches dark brown, glabrous, longitudinally wrinkled when dry; lenticels minute. *Leaves* alternate, dark green above, pale green below, dark brown and pale reddish brown respectively when dry, oblong, chartaceous, glabrous, 25—40 cm long, 8—15 cm broad, the greatest breadth a little above the middle, apex acutely acuminate, base rounded, margins entire; midrib fairly prominent below, secondary nerves 20—24, slender, about straight, ascending at an angle of about 60°, faintly archingly joined near the margin, tertiary nerves only faintly conspicuous below; petioles 1.5 to 2 cm long and 0.3 cm in diameter. *Female inflorescences* paniculate, axillary, minutely ferruginously pubescent, glabrescent at base, up to 12 cm long, the ramifications 2—5 cm long, the peduncle 0.1 to 0.2 cm thick, bracts not extant. *Flower buds* ovoid, about 0.2 cm, the pedicels up to 0.3 cm long, the perigonium consisting of 3 blunt tepals, which are ferruginously pubescent without, glabrous within. Ovary ovate, hardly pointed, glabrous. *Infrutescences* with about four fruits and up to 25 cm long, the peduncle 0.4 cm in diameter; pedicels 2 cm long and 0.2 cm thick. *Fruit* oblong-ovoid, green when young, turning yellow when ripe, glabrous, with a short gynophore, the apex blunt, about 3.5—4 × 1.5—2 cm; arillus laciniate at the top only, yellowish brown when dry, very minutely papillose; testa of seeds dark brown and shining, thin and cartilaginous; embryo very hard. Male plants unknown.

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[1]) Named in honour of Dr Lam's Sundanese attendant Iboet (cf. acknowledgement at the end of the General Part, p. 145).

Karakelong, Loc. 2, Pasir Malap, old forest on bank of K. Bahewa, alt. 20 m, May 13: *n. 2976* (*type specimen*, L., dupl. Bz.; nat. n.: *polòtan'a*).

Remarks: This species is characterized by the large leaves, the long female inflorescences and the slightly laciniate arillus. The genus is known from southern India (1 species), Malay Peninsula (4 sp.), Sumatra (1 sp.), N. Borneo (4 sp.), Philippines (4 sp.) and New Guinea (1 sp.).

Horsfieldia glabra (Bl.) Warb., Nov. Act. Akad. Naturf. 68, 1897, 313, t. 21.

Karakelong, Loc. 1, cleared old forest, alt. 120 m, April 27: *n. 2650* (tree, 17 m, fr. yellow-orange; nat. n.: *laràn'a*) — Loc. 2, old forest, alt. 70 m, May 4: *n. 2811* (tree, 35 m, ripe fr. prune-yellow; same nat. n.); old forest, alt. 200 m, frequent, May 10: *n. 2929* (tree, 16 m, fr. bright orange-coloured; same nat. n.).

Distribution: Java, Talaud.

Horsfieldia globularia (Bl.) Warb., l.c. 1897, 288, t. 21.

Morotai, Loc. 12, old forest, alt. 60 m, June 21: *n. 3499* (shrub, fr. orange-yellow).

Distribution: Malay Peninsula, Sumatra, Java, Celebes, Ambon, Morotai.

Horsfieldia novo-guineensis Warb., l.c. 68, 1897, 271, t. 23.

Karakelong, Loc. 1, partly cleared old forest, alt. 100 m, April 26: *n. 2628* (tree, about 20 m high, bole 9.8 m, diam. 0.3 m, trunk straight, almost cylindrical, somewhat furrowed, bark brown, branchlets d. brown, lvs. d. green, paler below, midrib yellowish, male buds green; nat. n.: *laràn'a*).

Distribution: Talaud, Aroe, Kai, Damar, New Guinea, Admiralty Islands.

Horsfieldia Roxburghii Warb., l.c. 68, 1897, 277, t. 21.

Morotai, Loc. 12, old forest, alt. 50 m, June 20: *n. 3459* (lvs. d. green, infl. l. green, male buds yellow, branchlets grey); alt. 100 m, June 21: *n. 3510* (tree, about 24 m high, bole 18 m, diam. 0.35—0.25 m, lvs. dull green, male buds yellow; nat. n.: *koelèman*).

Distribution: Morotai, Ternate, Ambon.

Horsfieldia sylvestris (Houtt.) Warb., l.c. 68, 1897, 337, t. 12.

Morotai, Loc. 12, old forest, alt. 50 m, frequent, June 20: *n. 3463* (tree, 25 m, fr. waxy l. green; nat. n.: *kokoemóétoe*); old forest, alt. 120 m, frequent, June 22: *n. 3538* (tree, 25 m; nat. n.: *kotomaetoe*).

Distribution: Malay Peninsula?, Sumatra, Java, Moluccas, New Guinea.

Myristica ?celebica Miq., Ann. Mus. Bot. Lugd.-Bat. 1, 1865—1866, 47.

Karakelong, Loc. 2, old forest, alt. 200 m, May 9: *n. 2919* (tree, 17 m, fr. dull green; nat. n.: *láhoe*); old forest, alt. 150 m, May 11: *n. 2942* (tree, 23 m; nat. n.: *tóétoeng'a*) — Loc. 7, old forest, alt. 100 m, frequent, June 3: *n. 3329* (tree, 10 m, fr. greyish green; nat. n.: *tóétoeng'a*).

Distribution: Celebes, Talaud.

MONIMIACEAE

Kibara cuspidata Bl., Mus. Bot. Lugd.-Bat. 2, 1852, 89.

Morotai, Loc. 12, G. Ligòjer, old forest, alt. 100 m, June 24: *n. 3588* (shrub, flow l. yellow); alt. 60 m, same date: *n. 3597* (shrub, fr. black, on bright orange-yellow torus).

Distribution: Malay Peninsula, Sumatra, Java, Borneo, Philippines, Morotai.

Matthaea sancta Bl., l.c. 1852, 89, t. 10.

Karakelong, Loc. 7, G. Piapi, old forest, bank of rivulet, alt. 50 m, June 3: *n. 3334* (small tree, 3 m, fr. bluish black, shining, reddish when young; nat. n.: *lábah*).

Distribution: Sumatra, Java, Borneo, Philippines, Talaud, Boeroe.

LAURACEAE

Cassytha filiformis L., Sp. Pl., 1753, 35.

Karakelong, Loc. 2, N. Maraloem, beach, May 16: *n. 3039* (hemiparasitic, entire plant dull l. green, flow. yellowish white) — Loc. 7, G. Piapi, alt. 400 m, May 31: *n. 3241* (stems orange-yellow, peduncles green, flow. greenish white) — Miangas, Loc. 9, grass-slope, alt. 50 m, June 11: *n. 3396* (stems green or yellow, fr. white; nat. n.: *bári-bári*).

Distribution: pantropic.

Cinnamomum ?celebicum Miq., Ann. Mus. Bot. Lugd.-Bat. 1, 1863—1864, 264.

Karakelong, Loc. 2, old forest on steep slope, alt. 200 m, frequent, May 6: *n. 2858* (tree, 6 m; nat. n.: *tahoelímpat'a*).

Distribution: Celebes, Talaud.

Litsea accedens (Meissn.) Boerl., Handl. Fl. Ned. Ind. 3, 1900, 145.

Karakelong, Loc. 7, G. Piapi, low forest, alt. 500 m, frequent, May 31: *n. 3267* (shrub, 1.5 m, fr. greenish yellow; nat. n.: *tahoerímpat'a*).

Distribution: Borneo, Celebes, Talaud.

Litsea Forstenii (Bl.) Boerl., l.c. 1900, 142.

Karakelong, Loc. 2, old forest, alt. 75 m, April 30: *n. 2694* (tree, 10 m, fr. d. green; nat. n.: *tahoerímpat'a*); Pasir Malap: riverbank, alt. 20 m, May 14: *n. 3010* (tree, 14 m; nat. n.: *abambáng'a*).

Distribution: Celebes, Talaud, Moluccas.

Litsea Perrottetii F.—Vill., Nov. App. 1880, 180.

Karakelong, Loc. 1, cleared forest, alt. 40 m, April 25: *n. 2586* (tree, 30 m, buttresses 1.5 m high and spreading, wood used for house and proa construction; nat. n.: *ba'ánah*).

Distribution: Celebes, Philippines, Talaud, Moluccas.

Nothaphoebe umbelliflora Bl., Mus. Bot. Lugd.-Bat. 1, 1851, 328.

Karakelong, Loc. 2, old forest, alt. 60 m, May 4: *n. 2823* (tree, 40 m, straight, diam. 0.95 m, buttresses 1 m high, 2 m spreading, wood very much in demand for house and proa construction; nat. n.: *linsánad'a*).

Morotai, Loc. 12, old forest, alt. 180 m, June 23: *n. 3564* (tree, 30 m, diam. 0.35 m; nat. n.: *oehéli* [Alifuru] or *goséhi* [Malay]).

Distribution: Malay Peninsula, Sumatra, Java, Borneo, Celebes, Talaud, Morotai. Perhaps identical with *N. malabonga* (Blco.) Merr. from the Philippines.

HERNANDIACEAE

Hernandia ovigera L., in Stickm., Herb. Amb., 1754, 14.

Karakelong, Loc. 2, old forest, steep slope, alt. 75 m, May 5: *n. 2839* (tree, 18 m high, bole 15 m, diam. 0.21—0.14 m, lvs. d. green with pale nerves, lighter below, peduncles dull l. green, calyx white, corolla white, tube greenish; nat. n.: **lilòk'a oeróéne*).

Distribution: East Africa to Polynesia.

CAPPARIDACEAE

Crataeva religiosa Forst. f., Prodr., 1786, 35.

Salebaboe, Loc. 3, sec. forest, alt. 20 m, May 21: *n. 3081* (small tree, fr. greyish brown; nat. n.: *papángi'nàsoe*).

Distribution: India to Polynesia.

Polanisia icosandra (L.) W. & A., Prodr., 1834, 22.

Nenoesa, Loc. 10, Merampi, cultivated grounds, alt. 100 m, June 13: *n. 3438* (herb, stem and lvs. l. green, calyx l. green, corolla yellow, fr. green; nat. n.: *abóéroe*).

Distribution: pantropic.

PITTOSPORACEAE

Pittosporum ferrugineum Ait., Hort. Kew., ed. 2, 2, 1811, 27.

Karakelong, Loc. 1, partly cleared old forest, alt. 120 m, April 27: *n. 2663* (tree, 14 m high, bole 3.65 m, diam. 0.44—0.22 m, trunk not cylindrical, bark grey, lvs. green; nat. n.: *riboesára*) — Loc. 7, G. Piapi, Pananasaran'a, open forest, alt. 350 m, June 2: *n. 3312* (tree, 10 m high, bole 5 m, diam. 0.15—0.12 m, trunk not straight, not cylindrical, lvs. rather d. green above, l. green below, midrib and petioles paler, ripe fr. yellowish orange, seeds brown, slimy; nat. n.: *abólo'a*) — Salebaboe, Loc. 3, G. Ajambana, old forest, alt. 250 m, May 22: *n. 3106* (tree, 17 m high, bole 6 m, diam. 0.24—0.20 m, trunk straight, cylindrical, pale grey, branchlets greyish brown, lvs. rather d. green above, lighter below, calyx and fr. l. green).

Distribution: S. China to Celebes, Moluccas, New Guinea and Australia.

ROSACEAE

Parastemon urophyllus A. DC., Ann. Sci. Nat. Sér. II, 18, 1842, 208.

Morotai, Loc. 12, old forest, alt. 130 m, June 22: *n. 3529* (tree with very hard wood, 28 m, flow. white; nat. n.: *nòoeng*).

Distribution: Malay Peninsula, Sumatra, Borneo, Morotai.

Pygeum ?latifolium Miq., Fl. Ind. Bat. I, pt. 1, 1855, 361.

Karakelong, Loc. 2, riverbank, alt. 50 m, May 1: *n. 2725* (tree, 27 m, fr. very l. yellowish green).

Distribution: Sumatra, Java, Soemba, Talaud.

Rubus fraxinifolius Poir., Enc. Bot. 6, 1804, 242.

Subspec. **celebicus** Bl., Bijdr. 1828, 1107.

Karakelong, Loc. 1, sec. forest, alt. 50 m, frequent, April 24: *n. 2522* (± climbing, flow. white, fr. bright red; nat. n.: *garoeat'a*) — Loc. 2, riverbank, alt. 40 m, scarce, May 3: *n. 2762* (same annotations and nat. n. as n. 2522).

Distribution of the subspecies: Celebes, Flores, Timor, Philippines, Talaud, Ternate, Ambon, Ceram; of the species: Formosa and Sumatra to Philippines and New Guinea.

LEGUMINOSAE

Albizzia saponaria (Lour.) Bl. in Miq., Fl. Ind. Bat. I, pt. 1, 1855, 19.

Karakelong, Loc. 1, open sec. forest, alt. 20 m, April 25: *n. 2565* (small curved tree, 3 m high, branchlets brown with pale lenticels, lvs. shining green, calyx and corolla greenish white, filaments white, anthers green; nat. n.: *langík'ā*) — Loc. 2, bank of K. Bahewa, skirt of forest, alt. 15 m, May 15: *n. 3028* (tree, 12 m high, bole 7 m, diam. 0.21—0.15 m, lvs. bright green above, slightly paler below, calyx greenish white, corolla, filaments, style and stigma white, anthers green; nat. n.: *langík'a*) — Salebaboe, Loc. 3, G. Ajambana, very frequent in sec. forest, alt. 150 m, May 20: *n. 3045* (tree, 8 m high, bole 6.2 m, diam. 0.11—0.09 m, further annotations as in n. 3028, but pedicels, calyx and corolla l. green; nat. n.: *langík'a*) — Kaboeroeang, Loc. 4, very frequent in sec. forest, alt. 20 m, May 26: *n. 3191* (tree, same annotations and nat. n. as n. 3045).

Distribution: Indo China, Celebes, Philippines, Talaud, Moluccas, Timor, New Guinea.

Cassia mimosoides L., Sp. Pl., 1753, 379.

Karakelong, Loc. 2, in alang-alang field east of Lobo, alt. 15 m, May 15: *n. 3024* (erect shrub, as high as the alang-alang, stem brownish grey, lvs. bright green, l. green below, petioles greenish white, calyx and pedicel brownish green, corolla yellow) — Nenoesa, Loc. 10, Merampi, near Dampoelis, cultivated grounds, alt. 100 m, June 13: *n. 3423* (shrub, ± 1.5 m high, stem l. yellowish green or slightly reddish, lvs. dull green, petioles paler, calyx and pedicel reddish green, corolla red, fr. green, brown with age).

Distribution: India and S. China to Philippines and Australia.

Dalbergia candenatensis (Dennst.) Prain, Journ. As. Soc. Beng. 70, 1901, 49.

Karakelong, Loc. 1, frequent in mangrove, alt. 5 m, April 23: *n. 2493* (liana in the undergrowth, several m long, calyx greenish white, corolla white).

Distribution: India and S. China to Philippines and Australia.

Dalbergia ferruginea Roxb., Fl. Ind., ed. 2, 3, 1832, 228.

Karakelong, Loc. 1, sec. forest: *n. 2601* (undershrub, flow. yellow; nat. n.: *saroempaníran'a*) — Salebaboe, Loc. 3, very frequent in sec. forest: *n. 3048* (± climbing shrub; same nat. n.).

Distribution: Borneo, Philippines, Talaud, New Guinea and Micronesia.

Dalbergia menoeides Prain in King, Journ. As. Soc. Beng. 66, 1898, 120.

Karakelong, Loc. 1, mangrove, alt. 2 m, April 23: *n. 2510a* (prostrate liana, collected under one number with *Derris heterophylla* [Willd.] Back., *Dalbergia* with fruits, *Derris* with flowers; nat. n.: *garàn-ap'a*; which of the two species bears this name cannot be concluded from the label).

Distribution: Malay Peninsula, Java, Talaud.

Derris heterophylla (Willd.) Backer in Heyne, Nutt. Pl. Ned. Ind., ed. 2, 2, 1927, 806.

Karakelong, Loc. 1, mangrove, alt. 2 m, April 23: *n. 2510* (prostrate liana, several m long, calyx greenish white, corolla white, anthers l. yellow, the leafless stems lie flat on the mud, bearing the erect infl.) [1]).

Distribution: tropical East Africa and Asia to Polynesia.

Desmodium gangeticum (L.) DC., Prodr. 2, 1825, 327.

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[1]) cf. *Dalbergia menoeides.*

Miangas, Loc. 9, in grove on G. Batoe, alt. 80 m, June 11: *n. 3380* (undershrub, lvs. l. green, corolla white, fr. green; nat. n.: *adóéroe*).

Distribution: paleotropic.

Desmodium heterocarpum (L.) DC., Prodr. 2, 1825, 337.

Karakelong, Loc. 1, sec. forest, alt. 10 m, April 23: *n. 2487* (shrub, calyx greenish white, corolla violet and white, filaments l. green, whitish at base, fr. l. brownish green, slightly violet); clearing in sec. forest, alt. 15 m, April 25: *n. 2600* (undershrub, ± 2 m high, lvs. dull green, slightly bluish above, calyx l. green, corolla l. violet) — Salebaboe, Loc. 3, G. Ajambana, sec. forest, alt. 150 m, May 20: *n. 3070* (shrub, branchlets brown, calyx l. green, corolla bluish violet, fr. l. brown).

Distribution: paleotropic.

Desmodium umbellatum (L.) DC., Prodr. 2, 1825, 325.

Nenoesa, Loc. 10, Merampi, on terrace of coral limestone, alt. 100 m, June 13: *n. 3431* (densely branched shrub, ± 4 m high, lvs. dull green above, l. green below, calyx l. green, corolla white, fr. dull green; nat. n.: *dára*).

Distribution: Mascarenes to Polynesia.

Desmofischera Holth., nov. gen. [1]

(Subfamily *Papilionatae*, Tribe *Hedysareae*, Group *Desmodiinae*)

Frutices vel suffrutices. *Folia* uni- vel trifoliolata, stipulis stipellisque suffulta. *Paniculae* terminales vel in axilla folii supremi axillares, floribus in fasciculis paucifloris dispositis. Pedicelli ebracteolati. *Calyx* campanulatus, 5-denticulatus, bilateraliter symmetricus. *Petala* unguiculata, vexillo obovato vel suborbiculari, apice paulo emarginato, alis vexillo carinaque multo brevioribus, carina partim connatis. *Stamina* 10, vexillari libero, ceteris filamentis parte suprema excepta connatis, tube stamineo usque ad basin ventraliter fisso. *Pistillum* gynophoro brevi insertum, rigide breviter pilosum, uniovulatum. *Legumen* deplanatum monospermum, haud articulatum, falcatum. *Semen* solitare, basin versus protrusum. *Embryo* ignotum.

Small shrubs or undershrubs. *Leaves* uni- or trifoliolate, stipules and stipels extant. *Flowers* in few-florous fascicles along the rhachis of the inflorescence. *Panicles* terminal or in the axil of the uppermost leaf. Pedicels ebracteolate. *Calyx* campanulate, with 5 unequal teeth. *Petals* distinctly clawed, vexillum obovate or almost circular and slightly emarginate, alae much shorter than vexillum or carina, partly connate with carina. *Stamens* 10, vexillary stamen entirely free, the others united into a tube, which is open on the ventral side. *Ovary* with short gynophore and short stiff hairs, uniovulate. *Pod* compressed, one-seeded, not articulate, more or less falcate. Seed directed downward. *Embryo* unknown.

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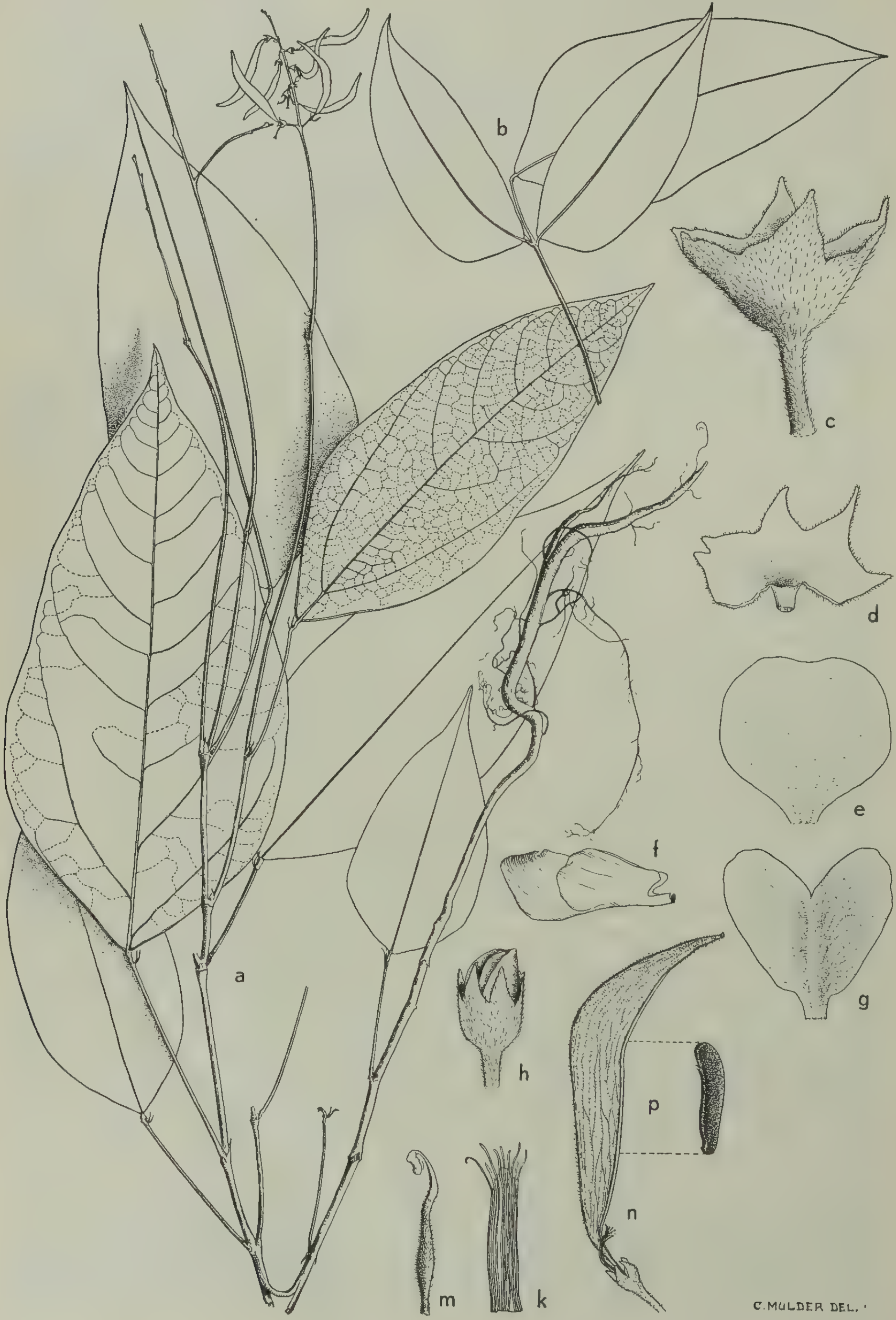
[1] The generic name, while alluding to the relation of *Desmofischera* and *Desmodium*, has been chosen in honour of the late Dr. Johann Baptist Fischer, a zoologist who, while in charge of Blume's and Von Siebold's collection in the Rijksherbarium at Brussels during the riots in September 1830, succeeded in safely transporting the valuable collections to Leiden, a perilous task, which will be recognized by every systematist to deserve the highest praise.

The present genus is closely related to *Desmodium* to which it shows much resemblance in the habit and in the structure of the flower, differing, however, in the pod, which is not articulate and contains only one seed. From the one-seeded *Desmodiinae* it differs in the general habit, in the form of the inflorescence, in the structure of the flower, in the presence of stipels and in the form of the fruit. For instance, both *Leptodesmia* Benth. and *Eleiotis* DC. are herbs, with much smaller leaflets of entirely different form, unstalked pistils and ovate fruits. *Phylacium* Benn. is also closely related but this is a liana with conspicuous bracts, an auriculate vexillum, the vexillary stamen free at base only and a sessile pistil.

I am much indebted to Dr C. A. Backer, who offered me valuable indications for the study of this new genus.

Desmofischera monosperma Holth., nov. spec., *Fig. 5* (p. 190).

Frutex vel suffrutex. *Caulis* haud vel paulo ramosa, lignosa, glabra vel minute pubescens, minute longitudinaliter striata, plerumque erecta nonnumquam partim prostrata, parte superiori tantum foliosa, basi c. 0.5 cm diametro. *Radix* primaria longa, lignosa, saepe cauli crassior. *Folia* alternata uni- vel interdum trifoliolata, petiolis (cum rhachide) glabris vel breviter tomentosis, i. s. longitudinaliter striatis, 2—9 cm longis; stipulae anguste triangulares, acutae, 0.4—0.5 cm longae, basi 0.2 cm latae, 5—9 nervis longitudinalibus praeditae; petioluli 0.2—0.4 cm longi, glabrescentes, rhachide in foliis trifoliolatis 2—3 cm longa; stipellae subulatae, glabrae, 0.5 cm longae; foliola chartacea, supra glabra vel subglabra, subtus pubescentia, oblongo-ovata, sub medio latiora, apicem versus gradatim angustata, 9—19 × 4—9 cm, apice acute acuminata, basi late acuta ima basi rotundata, marginibus integra paulo sinuata; costa media subtus conspicue, supra vix prominens, nervi secundarii 6—9, basales margine valde approximati, basi angulo 45°, apice 70° de costa adscendentes, paulo curvati, margines versus haud conjuncti; nervi tertiarii secundariis perpendiculares, ceterea reticulati; in foliis trifoliolatis foliola lateralia asymmetrica. *Paniculae* terminales vel in axillo folii supremi positae, usque ad 17 cm longae, rhachide minute pubescente, floribus fasciculis paucifloris unitis. Pedicelli ebracteolati, 0.2—0.25 cm longi, minute pubescentes, pilis haud hamosis ut in nonnullis *Desmodii* speciebus. *Flores* 0.8 cm longi, *calyx* 0.3 cm, fructu persistens, extus minute adpresse pubescens, intus glabra, campanulata 5-dentata, 2 dentibus posterioribus connatis lobis brevis obtusis exceptis, lateralibus late acutis, dente anteriore anguste acuta quam ceterae longiore, omnibus c. 0.1 cm longis. *Corolla* alba vel paulo lilacina; vexillum obovatum vel suborbiculare, brevissime unguiculatum, basi haud auriculatum, 0.5—0.6 × 0.4—0.6 cm, apice paulo emarginatum; alae oblique oblongae, petalis ceteris multo breviores, carina partim connatae, 0.4 × 0.2 cm, apice rotundatae, longiuscule unguiculatae, basi unilateraliter auriculatae; carinae partes duae oblongae, 0.7 × 0.3 cm, apice rotundatae, basi abrupte angustatae, unguiculatae. *Stamina* 10, c. 0.5 cm longa, stamen vexillare liberum, ceterorum filamenta partibus superioribus exceptis connata, tubo usque ad basin ventraliter fisso; filamentorum partes liberae inaequales, c. 0.1 cm longae, stamina omnia fertilia, antherae parvae, aequales. *Pistillum* c. 0.5 cm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C. MULDER DEL.

longum, ovarium uni-ovulatum, pubescens, gynophoro c. 0.15 cm longo, stylo glabro, 0.15 cm longo, a medio sursum curvato, stigmate obtuso, terminali. *Legumen* c. 3 × 0.4 cm, haud articulatum, valde deplanatum; semen solitare, medio leguminis affixum, basin versus protrusum. *Embryo* ignotum.

A small *shrub* or undershrub, up to about 0.75 m high. *Stem* not or slightly branched, woody, pale brown when dry, glabrous or shortly pubescent, minutely longitudinally grooved, mostly erect, sometimes partly prostrate, provided with leaves in the upper part only, at base about 0.5 cm in diameter. Main *root* strong, woody, up to 25 cm long, often thicker than stem. *Leaves* alternate, uni- or sometimes trifoliolate; petioles (and rhachis) glabrous or minutely tomentose, longitudinally grooved, 2—9 cm long; stipules narrowly triangular, acute, with 5—9 distinct longitudinal nerves, 0.4—0.5 cm long, about 0.2 cm broad at base; petiolules 0.2—0.4 cm long, glabrescent; rhachis in trifoliolate leaves 2—3 cm long; stipels subulate, 0.5 cm long, glabrous; leaflets chartaceous, oblong-ovate, greatest width below the middle from where the leaf gradually narrows, apex acutely acuminate, base broadly acute, the very base rounded, margins entire, slightly sinuate, 9—19 × 4—9 cm, glabrous and shining above with only some hairs on midrib and on bases of secondary nerves, densely pubescent below, particularly on the nerves, bright green, upper surface slightly darker than lower one; midrib prominent below, hardly so above, secondary nerves 6—9, the basal ones very close near the margin, those near the base ascending at an angle of about 45°, those in the upper part at an angle of about 70°, slightly curved, not joined near the margin, tertiary nerves reticulate, starting at almost right angles from midrib and secondary nerves, slender; in the trifoliolate leaves the lower leaflets are asymmetrical. *Inflorescences* terminal or axillary, paniculate, up to 17 cm long, flowers fascicled along the rhachis, which is shortly pubescent and longitudinally grooved. Pedicels 0.2—0.25 cm long, ebracteolate, covered with short hairs, which are not hook-shaped, as occurs in some species of *Desmodium*. *Flowers* about 0.8 cm long. *Calyx* about 0.3 cm, persistent in fruit, provided with short appressed hairs outside, glabrous within, campanulate, with five teeth, two posterior teeth connate but for two short blunt lobes, the two lateral teeth more pointed, rather broad, anterior tooth pointed, more slender and longer than the lateral ones, all teeth about 0.1 cm long, the lower one 0.125 cm. *Corolla* white or pale violet; vexillum obovate or almost circular, very shortly unguiculate, not auriculate at base, 0.5—0.6 × 0.4—0.6 cm, apex slightly emarginate; alae obliquely oblong, much shorter than carina and partially connate with it, 0.4 × 0.2 cm, apex rounded, rather long clawed, base unilaterally auriculate; each half of carina oblong, about 0.7 × 0.3 cm, apex rounded, abruptly narrowed into the claw. *Stamens* 10, about 0.5 cm long, vexillary stamen entirely free, other filaments connate so as to form

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Fig. 5 — *Desmofischera monosperma* Holth., n. gen., n. sp. — a. habit; b. trifoliolate leaf; c. calyx outside; d. ditto, split open; e. vexillum; f. carina and alae; g. carina from above; h. flower bud; k. staminal tube; m. carpel and style; n. pod and p. seed (a. after *Lam n. 2637*, b. after *Lam n. 3611*, c.—n. after *Lam n. 3057*).

a tube which is ventrally split down to the base; free terminal part of the filaments unequal in length, about 0.1 cm long; all stamens fertile; anthers small, equal in form. *Pistil* about 0.5 cm long, ovary uniovulate, pubescent, gynophore about 0.15 cm, style about 0.15 cm long, glabrous, curved upward from the middle or slightly below it, where it is somewhat broadened, stigma large, blunt, terminal. *Pod* about 3 cm long and 0.4 cm broad, not articulate, very flat, falcate, minutely pubescent, valves chartaceous, conspicuously reticulate, not dehiscent? *Seed* solitary, attached in the middle of the pod, directed towards the base. *Embryo* unknown.

Karakelong, Loc. 1, cleared old forest, rather frequent, alt. 90 m, April 26: *n. 2637* (small undershrub, partly prostrate, lvs. green, calyx l. green, corolla and filaments white, anthers l. brown, ovary green, fr. green; *type specimen,* L., dupl. Bz.) — Salebaboe, Loc. 3, G. Ajambana, cleared old forest, rather scarce, scattered, alt. 350 m, May 20: *n. 3057* (small shrub, stem l. brownish grey, lvs. d. green, slightly paler below, calyx and pedicel green, corolla white, filaments and pistil greenish white).

Morotai, Loc. 12, Goegoeti, old forest, alt. 300 m, June 25: *n. 3611* (shrub, about 0.75 m high, lvs. d. green above, paler below, dull, calyx greenish white, corolla, filaments and stigma white, ovary l. green); Marilako, old forest, along trail, rather frequent, scattered, alt. 20 m, June 28: *n. 3645* (shrub, lvs. bright green, paler below, calyx and pedicel l. green, corolla l. violet); old forest, rather frequent, scattered, alt. 10 m, June 30: *n. 3681* (lvs. bright green, slightly bluish green below, nerves l. green, calyx l. green, corolla white, fr. green).

Inocarpus edulis Forst., Char. Gen., 1776, 66, t. 33.

Karakelong, Loc. 2, very frequent in old forest, bank of K. Tatamboewe, alt. 50 m, May 7: *n. 2876* (straight tree, 29 m high, bole 12.5 m, diam. 0.76—0.59 m, trunk furrowed, brown, branchlets brown, bast contains much blood-red gum with acrid taste, lvs. d. green, midrib paler above, fr. green, pedicel brown; gum used as medicine against sprue; nat. n.: *iáma*) — Miangas, on coral limestone terrace, alt. 5 m, June 11: *n. 3359* (tree, ± 10 m high, trunk heavy, furrowed; often cultivated for the edible seeds; nat. n.: *kiáma*).

Distribution: Mauritius to Polynesia.

Intsia bijuga (Colebr.) O. Ktze, Rev. Gen. Pl., 1891, 192; Meyer Drees, Bull. Jard. bot. Buit., Sér. III, 16, 1938, 89.

Forma **glabra** Meyer Drees, l.c. 91.

Kaboeroeang, Loc. 4, Lapean'a forest reserve, very frequent in cleared forest, alt. 75 m, May 26: *n. 3173* (tree, 18 m high, bole 10 m, diam. 0.39—0.30 m, heartwood brown, very hard, bark l. greyish brown; lvs. bright green, midrib paler; wood much in demand for house construction; nat .n.: *síkat'a*).

Distribution both of the species and the forma: Madagascar to Polynesia.

Macropsychanthus dolichobotrys Holth., nov. spec., *Fig. 6* (p. 223).

Frutex scandens, robusta, glabra, partibus juvenilibus pubescentibus exceptis. *Folia* trifoliolata; foliola late ovata, glabra, 11—15 × 7—10 cm, apice acuminata, basi rotundata; petioluli crassi; stipulae acuto-ovatae;

stipellae minutae, subulatae. *Paniculae* angustae, ebracteatae, robustae, plus quam tripedales, axillares, multiflorae, basi glabrae, apicem versus pubescentes. *Flores* magni, 2.5 cm longi, violacei, bibracteolati. *Legumina* lignosa, 20 cm longa, semina disciformia, 2—5.

A *liana*, climbing to a height of about 30 m by means of the young shoots. Branches greyish brown when dry, with distinct lenticels, glabrous, the younger ones especially at the nodes with an appressed indumentum of long hairs. *Leaves* alternate, trifoliolate; petioles glabrous or subglabrous, 7—10 cm long, the base with a swollen, curved articulation; stipules acutely ovate, 0.3 × 0.4 cm, more or less pubescent; petiolules about 0.8 cm long, articulate and swollen, glabrescent; the rhachis between the base of the petiolule of the terminal leaflet and those of the lateral leaflets 2.8—3.7 cm long, glabrous and as thick as the petiole; stipels subulate, about 0.2 cm long, glabrous; leaflets chartaceous, broadly ovate, glabrous or the younger ones with some hairs on the midrib and the nerves below, 11—15 × 7—10 cm, somewhat shining at both sides, pale green, the upper surface a little darker than the lower one, apex acutely acuminate, base rounded, margins entire, midrib prominent below, hardly so above, secondary nerves 7—9, ascending at an angle of about 50°, slightly curved at base, strongly so near the margin and not joined there, tertiary nerves transverse, slender. *Inflorescences* axillary, narrowly paniculate, up to 1 m long, the peduncle (and rhachis) woody, dark green with brown lenticels, glabrous and 1 cm in diameter at base, tapering and gradually ferruginously pubescent towards the top, peduncle about 50 cm long, lateral ramifications ebracteate, slender, up to 2.5 cm long, bearing one open flower at a time and up to 9 scars of fallen flowers. Pedicels about 1 cm long and densely ferruginously pubescent; bracteoles 2, inserted immediately below the calyx, almost circular and 0.6 cm in diameter, densely pubescent below, glabrous above except at base. *Flowers* 2.5 cm long, *calyx* 1.7 cm, densely appressedly pubescent outside, villose inside, tube cylindrical, making an angle with the peduncle, lobes 5, 0.4—0.5 cm long and 0.4 cm broad, anterior lobe rounded, pubescent without, glabrous within except the margins, lateral lobes more or less deltoid, the anterior margin thinner and glabrous on either side. *Corolla* violet, petals all long-clawed, vexillum obovate, 2.5 × 1.8 cm, apex slightly emarginate, with two callosities near the base, alae obliquely oblong, 2 × 1 cm, apex rounded, subabruptly narrowed at lower half, very abruptly so into the narrow claw, each half of the carina oblong, about 2.3 × 0.7 cm, apex rounded, gradually narrowed into the claw, bases of vexillum and carina white, the filament of the vexillary stamen free at base for a small distance (0.3 cm), for about 0.6 cm united with the other filaments, the free terminal part about 0.7 cm long, the longest filaments about 2 cm, anthers brownish white, oblong, about 0.4 × 0.1 cm. *Gynaeceum* densely covered with long yellowish white hairs, the style glabrous and filiform. Ripe *pods* woody, brown, up to 20 cm long, 5.5 cm broad and about 2.5 cm thick, provided with scattered ferruginous hairs, acuminate and mucronulate, the margins often somewhat sinuate, base with a stout gynophore of about 2 cm long and 0.7 cm thick; pedicel about 1 cm long and 0.8 cm thick. Seeds 2—5 in a pod, dark brown and almost circular, glabrous, about 3 cm in diameter and 1.8 cm thick in the middle, slightly sloping down towards the margin; raphe grey, 6.6 cm long and 0.25 cm broad, surrounding the seed but for about 2 cm.

Karakelong, Loc. 2, bank of K. Tatamboewe, alt. 40 m, May 8: *n. 2893* (fruiting specimen); Pasir Malap, east of Lobo, frequent in old forest on riverbank, alt. 20 m, May 14: *n. 3002* (specimen with flowers; nat. n.: *limpoeroés'a*; *type specimen*, L., dupl. Bz.).

Remarks: Of the genus *Macropsychanthus* only five other species are known, viz. *M. Lauterbachii* Harms and *M. novoguineensis* Pulle from New Guinea, *M. mindanaensis* Merr. and *M. ferrugineus* Merr.[1]) from the Philippines (Mindanao) and *M. carolinensis* Kanehira & Hosokawa from the Carolines (Truk). Characteristic for the new species are the robust habit, and particularly the long and woody panicles with ebracteate and relatively elongate lateral ramifications. It differs:

a. from *M. Lauterbachii* by the broader and longer acuminate leaflets, by the longer and more slender lateral ramifications of the panicle, by the longer pedicels, by the large bracteoles just below the calyx and in that the vexillary filament is united with the other filaments for a longer distance.

b. from *M. novoguineensis* by the ovate, not lanceolate stipules, the longer petioles and the larger and longer acuminate leaflets, the longer and stouter inflorescences, the ebracteate and longer lateral ramifications of the panicle, which are not thickened at the top and bear the scars not only at the top of the ramification but scattered over the whole branchlet, by the larger flowers and in that the vexillary filament is united at base with the other filaments for a longer distance.

c. from *M. mindanaensis* and *M. ferrugineus* by the broader stipules, the stipels being much shorter than the petiolules, the longer acuminate leaves which are not pubescent as in *M. ferrugineus*, the stouter and longer inflorescences, the ebracteate lateral ramifications of the panicle which are longer and not thickened at the top and have the scars scattered over the whole branchlet.

d. from *M. carolinensis* by the smaller leaves, the much shorter rhachis of the leaves (about one tenth), the longer panicles, the smaller flowers which are not pink. By lack of material or a figure it is impossible to state more detailed differences between this species and *M. dolichobotrys*.

Mastersia Bakeri (Koord.) Back., in Koord., Suppl. Flora N. O. Celebes 3, 1922, 9.

Morotai, Loc. 12, old forest, alt. 60 m, June 21: *n. 3500* (liana several m long, lvs. d. green above, l. green below, petioles and calyx l. green, corolla dirty red, keel red; nat. n.: *abèteh*).

Distribution: Celebes, Halmahera, Morotai.

Mucuna gigantea (Willd.) DC., Prodr. 2, 1825, 405.

Karakelong, Loc. 1, wayside, alt. 5 m, April 28: *n. 2680* (climbing, ± 5 m long, calyx l. green, corolla and filaments greenish white, anthers d. brown, style greenish yellow, fr. green).

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[1]) Probably *M. ferrugineus* has to be considered a variety of *M. mindanaensis*.

Distribution: India to Polynesia.

Ormosia calavensis Azaola in Blco, Fl. Filip., ed. 2, 1845, 230.

Karakelong, Loc. 7, G. Piapi, Pananasaran'a, open forest, alt. 300 m, June 1: *n. 3296* (tree, 17 m high, bole 13 m, diam. 0.50—0.35 m, trunk curved, not cylindrical, lvs. bright green, slightly paler below, petioles l. yellowish green, infl. and peduncles l. brown, calyx brownish red pubescent, corolla dirty l. violet, standard l. green in the middle, filaments white, anthers d. grey, pistil l. greenish yellow; nat. n.: *nàki'mbawái*) — Saleb aboe, Loc. 3, frequent in cleared old forest, alt. 100 m, May 21: *n. 3073* (tree, 19.3 m high, bole 13.3 m, diam. 0.48—0.30 m, trunk straight, lvs. as in n. 3296, calyx coffee-brown, pedicels paler, corolla white, style and ovary pale yellowish green; nat. n.: *nàki'mbawái*).

Distribution: Celebes, Philippines, Talaud, Moluccas (Ambon).

Parkia javanica (Lam.) Merr., Sp. Blancoanae, 1918, 168.

Karakelong, Loc. 1, fairly frequent in sec. forest, alt. 100 m, April 27: *n. 2652* (tree with flat top, ± 10 m high, bole 2 m, diam. 0.3 m at a height of 1 m, low branched, lvs. d. green above, l. green below, ferruginously pubescent, calyx l. green, corolla l. yellowish green in bud, fr. d. brown; nat. n.: *lanángoh*) — Loc. 3, at junction of K. Bahewa and K. Tatamboewe, riverbank, alt. 40 m, fairly frequent, May 11: *n. 2945* (tree, 13 m high, bole 8 m, diam. 0.22—0.18 m, branchlets reddish brown, lvs. dull green, d. above, paler below, petioles brownish green; nat. n.: *lariángoh*).

Distribution: India to Philippines, Talaud and Timor.

Pongamia pinnata (L.) Merr., Interpret. Herb. Amb., 1917, 271.

Karakelong, Loc. 1, beach, alt. 1 m, April 23: *n. 2499* (tree, 8 m high, lvs. green, nerves l. green, fr. green; nat. n.: *laíta*).

Distribution: Mascarenes to Polynesia.

Pueraria pulcherrima (Koord.) Merr., in Koord.-Schum., Syst. Verz. 2, 1914, 132.

Karakelong, Loc. 2, very frequent in forest on riverbank, alt. 50 m, May 1: *n. 2718* (liana, several m long, bright green above, silky shining l. green below, pedicels l. green, calyx dull violet, corolla pale violet; nat. n.: *bàgeh*).

Distribution: Celebes, Talaud, Philippines.

Pueraria Thunbergiana (S. & Z.) Benth., Journ. Linn. Soc. Bot. 9, 1865, 122.

Karakelong, Loc. 2, bank of K. Bahewa, alt. 1 m, fairly frequent, May 16: *n. 3037* (climbing, several m long, lvs. l. green, paler below, calyx tube dirty violet, lobes and pedicels l. green, corolla violet, alae a little darker, vexillum with large yellow spot in the centre, filaments, style and stigma white, anthers pale yellow; nat. n.: *bàgeh*).

Distribution: India to Japan and Polynesia.

Uraria lagopodioides (L.) Desv., Mém. Soc. Linn. Paris 4, 1826, 309.

Salebaboe, Loc. 3, wayside, alt. 20 m, May 21: *n. 3089* (partly prostrate undershrub, lvs. dull green, slightly paler below, calyx l. reddish brown, turning brown with age, covered with white hairs, corolla l. violet).

Distribution: India and S. China to tropical Australia.

OXALIDACEAE

Biophytum sensitivum (L.) DC., Prodr. 1, 1824, 690.

Saleba boe, Loc. 3, G. Ajambana, on ladang, alt. 150 m, May 21: *n. 3084* (herb, stem reddish brown, lvs. sensitive, d. green above, l. green below, red when young, petioles often red, calyx green, corolla yellow) — Miangas, Loc. 9, G. Soro, grass-slope, alt. 60 m, June 11: *n. 3397* (herb, lvs. bright green, petioles and stem red, calyx l. green, corolla yellow, lvs. sensitive; nat. n.: *róénti'i*).

Distribution: pantropic.

RUTACEAE

Evodia ?glabra (Bl.) Bl., Bijdr., 1825, 245.

Karakelong, Loc. 2, frequent on riverbank, alt. 50 m, May 4: *n. 2821* (tree, 18 m; nat. n.: *maratálang'a*).

Distribution: Malay Peninsula, Sumatra, Java, Celebes, Talaud, Lesser Sunda Islands, New Guinea.

Evodia latifolia DC., Prodr. 1, 1824, 724.

Karakelong, Loc. 1, sec. forest behind beach, April 23: *n. 2506* (shrub; nat. n.: *sengíjoh*); sec. forest, alt. 100 m, very frequent, April 25: *n. 2576* (tree, 8 m; same nat. n. as n. 2506).

Distribution: India to Celebes, Philippines?, Talaud and Halmahera.

Evodia ?Minahassae (Miq.) Teijsm. & Binn., Nat. Tijdschr. N. I. 29, 1867, 255.

Karakelong, Loc. 2, Pasir Malap, old forest, alt. 60 m, May 13: *n. 2974* (tree, 25 m, flow. white; nat. n.: *maratálam'a*).

Distribution: N. Celebes, Talaud.

Glycosmis pentaphylla (Retz) Correa, Ann. Mus. Hist. Nat. Par. 6, 1805, 386.

Karakelong, Loc. 2, Pasir Malap, old forest, alt. 40 m, May 13: *n. 2985* (small tree, flow. white) — Miangas, Loc. 9, G. Batoe, in grove, 90 m alt., very frequent, June 11: *n. 3354* (same annotations as n. 2985; nat. n.: *sóéwi*).

Distribution: India and S. China to Philippines and New Guinea.

Lunasia amara Blco, Fl. Filip., 1837, 783.

Karakelong, Loc. 1, cleared old forest, 100 m alt., April 27: *n. 2661* (small tree, 2 m) — Loc. 2, old forest, alt. 30 m, May 13: *n. 2987* (small tree, 3 m) — Loc. 7, G. Piapi, low forest on top, alt. 480 m, fairly frequent, June 1: *n. 3291* (shrub); alt. 250 m, June 2: *n. 3305* (shrub, flow. yellowish) — Kaboeroeang, Loc. 4, Lapean'a forest reserve, alt. 75 m, May 26: *n. 3181* (large shrub, 3 m; nat. n.: *malimpètan'a*).

Distribution: Java, Borneo, Celebes, Philippines, Talaud, Aroe, New Guinea.

Melicope triphylla (Lam.) Merr., Phil. Journ. Sci. Bot. 7, 1912, 375.

Karakelong, Loc. 1, sec. forest, alt. 100 m, April 24: *n. 2533* (small tree, 8 m; nat. n.: *sengíjoh*) — Loc. 2, old forest, alt. 250 m, May 7: *n. 2869* (tree, 12 m, flow. greenish white; nat. n.: *arangíjoh*).

Distribution: Philippines, Talaud.

Micromelum minutum Seem., Mission Fiji, 1862, 434.

Salebaboe, Loc. 3, sec. forest, alt. 50 m, May 20: *n. 3046* (small tree, 4 m, fr. orange-red; nat. n.: **marimbòs'a*).

Distribution: India and S. China to Polynesia and Australia.

Triphasia trifolia (Burm. f.) P. Wils., Torreya 9, 1909, 33.

Miangas, Loc. 9, in grove on G. Kota, 90 m alt., frequent, June 11: *n. 3356* (shrub, 2.5 m, flow. white, frequent; nat. n.: *aloewàtoe*).

Distribution: pantropic.

Zanthoxylum Avicennae (Lam.) DC., Prodr. 1, 1824, 726.

Karakelong, Loc. 7, G. Piapi, frequent, on sunny slope, alt. 300 m, May 31: *n. 3254* (small tree or large shrub, 3 m, flow. greenish white, fr. greenish yellow and red, seeds black; nat. n.: **marimbôs'a*).

Distribution: S. China, Philippines (mountains), Talaud, Moluccas?

BURSERACEAE (H. J. Lam)

Canarium asperum Benth., Lond. Journ. Bot. 2, 1843, 215; H. J. Lam, Bull. Jard. bot. Buit., Sér. III, 12, 1932, 461, fig. 66.

Forma *α* **legitimum** H. J. Lam, l.c. 463.

Karakelong, Loc. 1, cleared old forest, alt. 40 m, April 25: *n. 2580* (young tree, ± 10 m high, lvs. shining; nat. n.: **nàti'mbaráwo*) — Loc. 2, old forest, alt. 100 m, May 7: *n. 2885* (very young tree; same nat. n.); alt. 230 m, frequent, May 10: *n. 2927* (young tree, 12 m high, bole 10.4 m, trunk l. grey, lvs. bright green, innovations brown pubescent; same nat n.).

Distribution of forma *α*: Talaud, Moluccas, New Guinea.

Forma *β* **triphyllum** H. J. Lam, l.c. 463.

Morotai, Loc. 12, alt. 100 m, frequent in old forest, June 21: *n. 3505* (tree, 18 m high, bole 11 m, diam. 0.20—0.15 m, lvs. shining above, calyx greenish white, corolla creamy white, fr. dull green; nat. n.: *neríhaka*).

Distribution of forma *β*: Ambon, Ternate, Morotai.

Distribution of the species: Kangean, Lesser Sunda Islands, Celebes, N. Borneo, Philippines, Talaud, Moluccas, New Guinea.

Canarium balsamiferum Willd., Sp. Pl. 4, 1805, 760; H. J. Lam, l.c. 1932, 485, fig. 75.

Karakelong, Loc. 2, old forest, alt. 250 m, May 7: *n. 2870* (tree, 17 m high, bole 10.6 m, diam. 0.19—0.15 m, lvs. shining, d. green above, l. green below, nerves lighter on either side, calyx l. green, corolla white, fr. dull green; nat. n.: **màti'mpóéne*); Pasir Malap, frequent in old forest, alt. 60 m, May 13: *n. 2978* (young tree, with l. grey trunk, fr. dull black-violet, calyx dirty green; same nat. n.).

Distribution: Celebes, Talaud, Moluccas (Boeroe, Ambon).

Canarium commune L., Mant. I, 1767, 127; H. J. Lam, l.c. 1932, 509.

Salebaboe, Loc. 3, G. Ajambana, very frequent in old forest, alt. 260 m, May 23: *n. 3131* (tree, 30 m high, bole 14 m, diam. 0.80—0.73 m, buttresses 3.5 m high and spreading, trunk grey, straight, heartwood brown, very hard, used for house and proa construction, fr. shining green, seeds edible; nat. n.: *nàki*).

Morotai, Loc. 12, Goegoeti, very frequent in old forest, alt. 50 m, June 20: *n. 3457* (tree, 30 m high, bole 20 m, diam. 0.7—0.5 m, calyx l. green, corolla l. yellow; nat. n.: *níar*).

Distribution, in a wild state: Kangean, Salijara, Celebes, Talaud, Flores, Ternate, Morotai; widely cultivated as a wayside tree.

Canarium decumanum Gaertn., De Fruct. et Sem. 2, 1791, 99; H. J. Lam, l.c. 1932, 435.

Morotai, Loc. 12, Marilako, frequent in old forest, alt. 20 m, June 28: *n. 3637* (tree, 15 m high, bole 6 m, diam. 0.35—0.25 m; nat. n.: *hobóéroe* [Alifuru] or *hápo* [Moluccan Malay]).

Distribution: Borneo, Moluccas (Morotai, Ternate, Batjan).

Remark: This tree may attain a hight of more than 50 m.

Canarium hirsutum Willd., Sp. Pl. 4, 1805, 760; H. J. Lam, l.c. 1932, 466, fig. 67.

Forma *α* **typicum** H. J. Lam, l.c. 1932, 466.

Morotai, Loc. 12, Marilako, old forest, alt. 20 m, June 28: *n. 3652* (young tree; nat. n.: *médeh-médeh*).

Distribution of the forma: Malay Peninsula to Philippines, Celebes and Morotai; of the species: Malay Peninsula to Philippines and New Guinea.

Canarium lian H. J. Lam, l.c. 1932, 440, fig. 52.

Morotai, Loc. 12, old forest, Goegoeti, alt. 50 m, June 20: *n. 3462* (young tree; nat. n.: *lían*); alt. 60 m, same date: *n. 3472* (young tree, petioles and stipules l. brown pubescent); same locality, frequent, June 22: *n. 3531* (tree with straight cylindrical trunk, 15 m high, bole 11 m, diam. 0.15—0.12 m, bark grey-spotted, branches grey, branchlets brown; nat. n.: *lían*).

Distribution: Batjan, Morotai.

Garuga floribunda Decne., Nouv. Ann. Mus. Par. 3, 1834, 477; H. J. Lam, l.c. 1932, 326, fig. 7A.

Kaboeroeang, Loc. 4, Tonan'a forest reserve, cleared old forest, very frequent, alt. 25 m, May 26: *n. 3178* (tree, 12 m high, with three trunks united at the base, bole 10 m, diam. 0.12—0.08 m, lvs. dull green, d. green above, l. green below; nat. n.: *tatóél'a*).

Distribution: E. Java, Kangean, Celebes, Lesser Sunda Islands, Philippines, Moluccas to Polynesia and Australia (the two other species of the genus are continental Asiatic).

Haplolobus moluccanus H. J. Lam, l.c. 1932, 407, fig. 40.

Morotai, Loc. 12, old forest, alt. 130 m, June 22: *n. 3550* (young tree, with white bark); Goegoeti, G. Ligòjer, frequent in old forest, alt. 100 m, June 24: *n. 3583* (tree with straight, cylindrical trunk, 12 m high, bole 9 m, diam. 0.15—0.11 m, bark l. grey, lvs. d. green, nerves and petioles lighter; nat. n.: *lían daoen lèbar* (lian with large leaves); Marilako, old forest, alt. 20 m, frequent, June 28: *n. 3653* (tree, 13.7 m high, diam. 0.08—0.05 m, further same annotations and nat. n. as n. 3583).

Distribution: Ambon, Halmahera, Morotai (the genus centres in New Guinea).

MELIACEAE

Aglaia argentea Bl., Bijdr., 1825, 170.

Morotai, Loc. 12, old forest, alt. 50 m, June 20: *n. 3471* (small tree, 3 m, fr. cinnamon-brown pubescent); Marilako, old forest, alt. 20 m, June 28: *n. 3651* (tree, 15 m, infl. brown pubescent; nat. n.: *lóéka-lóékam*).

Distribution: Malay Peninsula, Java, Borneo, Celebes, Morotai, New Guinea.

Aglaia ganggo Miq., Fl. Ind. Bat., Suppl., 1860—1861, 506.

Salebaboe, Loc. 3, frequent in old forest, alt. 320 m, May 23: *n. 3126* (tree, 15 m, infl. brown pubescent; nat. n.: *parawóénoet'a*).

Morotai, Loc. 12, old forest, alt. 60 m, June 20: *n. 3473* (small tree, 4 m high, infl. l. greenish brown).

Distribution: Malay Peninsula, Sumatra, Java, Borneo, Celebes, Talaud, Morotai, Ambon.

Dysoxylum arborescens (Bl.) Miq., Ann. Mus. Bot. Lugd.-Bat. 4, 1868, 24.

Morotai, Loc. 12, G. Ligòjer, frequent in old forest, alt. 50 m, June 27: *n. 3631* (tree, 10 m, flow. white, disagreeable odour).

Distribution: Indo China to Timor, Philippines and Moluccas.

Vavaea amicorum Benth., Lond. Journ. Bot. 2, 1843, 212.

Nenoesa, Loc. 10, Merampi, very frequent in sec. forest, alt. 100 m, June 13: *n. 3417* (tree, 15 m, flow. white, fr. l. green; nat. n.: *antamát'a*).

Distribution: Philippines, Talaud, New Guinea, Polynesia.

POLYGALACEAE

Epirixanthes elongata Bl., Cat. Gew. Buitenz., 1823, 82.

Karakelong, Loc. 2, old forest, alt. 80 m, May 2: *n. 2745* (saprophytic, stem pale brown, infl. d. brown at base, l. brown towards apex).

Distribution: Sumatra, Java, Borneo, Talaud, Ambon.

Polygala glomerata Lour., Fl. For. Conchinch., 1790, 426.

Karakelong, Loc. 7, G. Piapi, open slope, alt. 400 m, May 31: *n. 3250* (herb, flow. white with lilac heart).

Distribution: India to Philippines, Talaud and ? New Guinea.

EUPHORBIACEAE

Acalypha amentacea Roxb., Fl. Ind., ed. 2, 3, 1832, 676.

Karakelong, Loc. 1, very frequent in sec. forest, alt. 10 m, April 23: *n. 2497* (shrub; nat. n.: *laransiàn'a*); alt. 20 m, April 25: *n. 2567* (large shrub to 6 m; same nat. n.) — Kaboeroeang, Loc. 4, very frequent in sec. forest, alt. 20 m, May 26: *n. 3190* (protandrous; same nat. n.) — Miangas, Loc. 9, in grove on G. Batoe, alt. 80 m, June 11: *n. 3358* (petioles reddish, infl. l. yellowish green; same nat. n.).

Distribution: Java, Borneo, Celebes, Philippines, Talaud, Moluccas, New Guinea.

Acalypha boehmerioides Miq., Fl. Ind. Bat., Suppl., 1861—1862, 459.

Miangas, Loc. 9, P. Baronto, limestone, alt. 7 m, June 11: *n. 3368* (undershrub, infl. l. green).

Distribution: Malaysia to Polynesia.

Acalypha Caturus Bl., Bijdr., 1825, 619.

Karakelong, Loc. 2, riverbank, alt. 40 m, May 3: *n. 2766* (curved tree, 15 m, nerves greenish yellow, infl. green).

Distribution: Sumatra to Philippines, Moluccas and New Guinea.

Alchornea rugosa (Lour.) Muell. Arg., Linnaea 34, 1865, 170.

Saleb aboe, Loc. 3, wayside, alt. 20 m, very frequent, May 21: *n. 3093* (shrub, 2 m, twigs and petioles reddish; nat. n.: *aoemángan'a*) — Kaboeroeang, Loc. 4, sec. forest, alt. 20 m, frequent, May 26: *n. 3189* (infl. l. green, fr. dirty green-violet; same nat. n.).

Morotai, Loc. 12, old forest, alt. 130 m, locally frequent, June 22: *n. 3556* (shrub, 1.5 m).

Distribution: S. China and Malay Peninsula to Polynesia, New Guinea and Timor.

Antidesma celebicum Koord., Meded. 's Lands Plantent. 19, 1898, 625.

Miangas, Loc. 9, G. Kota, small grove, alt. 90 m, June 11: *n. 3379* (small tree, ± 6 m high, lvs. bright green, infl. l. green, anthers greenish yellow; nat. n.: *bánah*).

Distribution: Java, Borneo, Celebes, Talaud, Moluccas, Lesser Sunda Islands, New Guinea.

Antidesma Cumingii Muell. Arg. in DC., Prodr. 15, 1866, 249.

Karakelong, Loc. 2, old forest, alt. 100 m, April 30: *n. 2693* (very lax shrub, 3 m, fr. pink; nat. n.: *góénoe*) — Loc. 7, G. Piapi, alt. 300 m, open forest, June 1: *n. 3298* (shrub, 1.5 m, branchlets l. grey) — Salebaboe, Loc. 3, old forest, alt. 320 m, May 23: *n. 3136*.

Distribution: Philippines, Talaud.

Antidesma ghaesembilla Gaertn., Fruct. et Sem. 1, 1788, 189, t. 39.

Nenoesa, Loc. 10, Merampi, alt. 150 m, very frequent in sec. forest, June 13: *n. 3424* (tree, 0.5—8 m, fr. red, acid, edible; nat. n.: *tara'óéoe*).

Distribution: paleotropic.

Baccaurea javanica (Bl.) Muell. Arg. in DC., Prodr. 15, 1866, 465.

Karakelong, Loc. 2, old forest, alt. 75 m, May 2: *n. 2739* (tree, 6 m, fr. shining green; nat. n.: *anggóésip'a*).

Distribution: Sumatra, Java, Borneo, Celebes, Talaud.

Bischofia javanica Bl., Bijdr., 1825, 1168.

Karakelong, Loc. 2, old forest, alt. 250 m, May 8: *n. 2901* (heavy tree, 23 m high, bole 16 m, diam. 0.63—0.32 m, trunk straight, cylindrical, bark brown, strongly scaling, bast with blood-red gum, sapwood red, heartwood d. reddish brown, very hard, lvs. d. green; wood much in demand for house construction, bast used for dying fishing cords; nat. n.: *bóéroeng'a*).

Distribution: India and S. China to Formosa and Polynesia.

Blumeodendron paucinervium (Elm.) Merr., Phil. Journ. Sci. Bot. 16, 1920, 555.

Salebaboe, Loc. 3, frequent in old forest, alt. 320 m, May 23: *n. 3122* (tree, 12 m; nat. n.: *aloewàtoe*).

Distribution: Philippines, Talaud. Closely related to *B. tokbrai* Kurz from Sumatra, Java and Borneo.

Breynia cernua (Poir.) Muell.-Arg. in DC., Prodr. 15, 1866, 439.

Karakelong, Loc. 1, sec. forest, alt. 10 m, April 23: *n. 2507* (shrub, 1.5 m, flow. l. green, fr. bright red; nat. n.: *lalamóéran'a*) — Loc. 2, old forest, alt. 200 m, May 10: *n. 2933* — Miangas, Loc. 9, in grove on G. Batoe, alt. 80 m, June 11: *n. 3365* (nat. n.: *larimóéta*).

Distribution: Java, Celebes, Philippines, Talaud, Moluccas, Soemba, Timor, New Guinea, Australia.

Bridelia glauca Bl., Bijdr., 1825, 597.

Karakelong, Loc. 2, riverbank, alt. 40 m, May 7: *n. 2875* (tree, 13.5 m, fr. shining l. green; nat. n.: *lábah*).

Distribution: Sumatra, Java, Borneo, Celebes, Philippines, Talaud, Moluccas.

Bridelia minutiflora Hook. f., Fl. Brit. Ind. 5, 1887, 273.

Kaboeroeang, Loc. 5, cleared forest, alt. 200 m, May 27: *n. 3201* (tree, 9 m; nat. n.: *samái*; wood for house construction, bast used for colouring the saguwer [palm wine] red).

Distribution: Malay Peninsula to Philippines and New Guinea.

Claoxylon longifolium (Bl.) Miq., Fl. Ind. Bat. 1, pt. 2, 1859, 386.

Nenoesa, Loc. 11, Garete, cleared forest on limestone, alt. 5 m, June 14: *n. 3449* (young tree, 2.5 m, flow. greenish white, fr. l. green; nat. n.: *antóéwoe*).

Morotai, Loc. 12, old forest, alt. 120 m, June 22: *n. 3534* (shrub, 1.5 m, fr. bright green; nat. n.: *ladatáit*).

Distribution: India to Borneo, Philippines?, Celebes, Talaud, Morotai, Lesser Sunda Islands and Micronesia.

Cleistanthus megacarpus C. B. Rob., Phil. Journ. Sci. Bot. 6, 1911, 232.

Morotai, Loc. 12, old forest, swamp, alt. 60 m, June 25: *n. 3607* (shrub, 1 m).

Distribution: Borneo, Philippines (Mindoro, Sibuyan, Negros, Samar, Mindanao), Morotai.

Cleistanthus myrianthus (Hassk.) Kurz, For. Fl. Burma 2, 1877, 370.

Karakelong, Loc. 2, old forest, alt. 250 m, May 8: *n. 2900* (tree, 15 m, fr. dirty green; nat. n.: *pilápi*); Pasir Malap, alt. 60 m, frequent, May 13: *n. 2980* (tree, 11 m, fr. green; nat. n.: *áloe rámoet'a*) — Loc. 7, G. Piapi, frequent in old forest, alt. 100 m, June 3: *n. 3337* (tree, 14 m, fr. reddish green; nat. n.: *rámoet'a*).

Distribution: Burma to Philippines and New Guinea.

Codiaeum variegatum (L.) Bl., Bijdr. 1825, 606.

Var. α **moluccanum** (Decne.) Muell--Arg. in DC., Prodr. 15, 1866, 1119.

Karakelong, Loc. 2, old forest, 200 m alt., frequent, May 2: *n. 2888* (small tree, 1.3 m, fr. brown); Pasir Malap, old forest, alt. 50 m, frequent, May 13: *n. 2993* (tree, 2 m, infl. and flow. creamy white); alt. 40 m, May 14: *n. 3013* (flow. greenish white; nat. n.: **tolendsoe*).

Distribution of the wild var. (var. β *pictum* is cultivated) not exactly known; probably wild in Fiji, N. Australia, Bismarck Archipelago, New Guinea, Moluccas, Talaud (!), Celebes and the Lesser Sunda Islands. Records from other places are less trustworthy. According to Merrill (Enum. Phil. Flow. Pl. 2, 1923, 454) the species is not wild in the Philippines.

Croton argyratus Bl., Bijdr., 1825, 602.

Karakelong, Loc. 2, old forest, alt. 250 m, May 7: *n. 2872* (tree, 7 m, lvs. almost white below, flow. white; nat. n.: **binoenga'mbabi*).

Distribution: Burma to Philippines, Talaud and Ceram.

Croton laevifolius Bl., Bijdr., 1825, 603.

Karakelong, Loc. 7, G. Piapi, in forest, alt. 300 m, May 31: *n. 3277* (tree, 8 m, flow l. green).

Distribution: Malay Peninsula to Philippines and New Guinea.

Cyclostemon ?littoralis C. B. Rob., Phil. Journ. Sci. Bot. 3, 1908, 198.

Karakelong, Loc. 2, Pasir Malap, frequent in old forest, alt. 40 m, May 13: *n. 2984* (tree, 13 m; nat. n.: *tabóéroh*).

Distribution: Philippines, Talaud.

Cyclostemon Minahassae Boerl. & Koord. in Koorders, Med. 's Lands Plantent. 19, 1898, 590.

Karakelong, Loc. 2, old forest, steep slope, alt. 80 m, May 5: *n. 2840* (tree, 15 m; nat. n.: *mamántoe*).

Distribution: Java, Borneo, Celebes, Talaud.

Endospermum formicarum Becc., Malesia 2, 1884, 44.

Morotai, Loc. 12, bank of K. Goegoeti, alt. 40 m, frequent, June 21: *n. 3495* (straight tree, 20 m high, bole 15 m, diam. 0.30—0.15 m, branchlets hollow, inhabited by ants, lvs. green, nerves paler, fr. l. green; nat. n.: *péa-péa*).

Distribution: Morotai, New Guinea, Bismarck Archipelago.

Euphorbia Atoto Forst. f., Prodr., 1786, 207.

Miangas, Loc. 9, P. Baronto, alt. 7 m, frequent, June 11: *n. 3374* (undershrub, l. green, infl. green; nat. n.: **pampóéloe*).

Distribution: S.E. Asia to Australia and Polynesia.

Euphorbia serrulata Reinw. ex Bl., Bijdr., 1825, 635.

Karakelong, Loc. 2, Noesa Maraloem, between alang-alang, alt. 5 m, May 16: *n. 3036* (herb, stems reddish, glands of cyathia white, fr. red; nat. n.: **pampóéloet'a*).

Distribution: S. China to Australia and Polynesia; the hairy form (this specimen) is known from E. Java, Madoera, Kangean, Lesser Sunda Islands, Talaud and New Guinea.

Excoecaria Agallocha L., Syst., ed. 10, 1759, 1288.

Miangas, Loc. 9, P. Baronto, limestone rocks, alt. 7 m, June 11: *n. 3371* (shrub, ± 2 m high, branchlets brown, lvs. coriaceous, shining d. green above, l. green below, petioles greenish white, infl. l. green, filaments greenish white, anthers yellow; nat. n.: *lári*).

Distribution: S.E. Asia to Polynesia.

Glochidion philippicum (Cav.) C. B. Rob., Phil. Journ. Sci. Bot. 4, 1909, 103.

Karakelong, Loc. 2, riverbank, alt. 50 m, May 1: *n. 2730* (tree, 20 m, flow. l. yellowish green, wood very hard, bark black).

Distribution: Sumatra, Java, Celebes,. Philippines, Formosa, Talaud, Moluccas, New Guinea.

Glochidion rubrum Bl., Bijdr., 1825, 586.

Karakelong, Loc. 7, G. Piapi, open slope, alt. 400 m, May 31: *n. 3269* (small tree, 4 m).

Distribution: Malay Peninsula, Sumatra, Java, Kangean, Borneo, Philippines, Talaud.

Glochidion zeylanicum (Gaertn.) Juss., Tent. Euph., 1824, 107.

Var. **malayanum** J. J. Smith in Koorders et Valeton, Bijdr. Booms. Java 12, 1910, 118.

Karakelong, Loc. 1, sec. forest, frequent, April 24: *n. 2529* (tree, 5—8 m, flow. l. green; nat. n.: *bánah*) — Loc. 2, riverbank, alt. 50 m, May 3: *n. 2784* (tree, 10 m, young lvs. red, flow. l. yellow, fr. yellow and red like a peach; nat. n.: *bánah*) — Nenoesa, Loc. 10, Merampi, sec. forest, alt. 130 m, frequent; June 13: *n. 3430* (flow. yellowish green).

Distribution of the species: India to Philippines, Talaud, Moluccas? Australia?, of the variety: Sumatra, Java, Celebes, Philippines, Talaud, Ambon?, Australia?

Homalanthus populneus (Geisel.) Pax in Engl. & Prantl, Nat. Pflanzenf. 3, pt. 5, 1890, 96.

Karakelong, Loc. 1, sec. forest, alt. 100 m, April 24: *n. 2542* (small tree, 4 m high, lvs. l. green, old lvs. wine-red, infl. l. green; nat. n.: *peránti*).

Distribution: Malay Peninsula to Philippines and New Guinea.

Macaranga hispida (Bl.) Muell.-Arg. in DC., Prodr. 15, 1866, 990.

Karakelong, Loc. 1, sec. forest, alt. 80 m, April 24: *n. 2527* (small tree, ± 4 m high, bole straight, 2 m, resin sticky, reddish brown, bark d. green, infl. l. yellowish green, corolla l. greenish yellow, filaments white translucent, anthers l. brown; nat. n.: *míndang'a*) — Loc. 2, very frequent in forest on riverbank, alt. 50 m, May 1: *n. 2727* (tree, 26 m high, bole 19.8 m, diam. 0.43—0.20 m, bark greenish grey, lvs. d. green shining above, paler and dull below, nerves l. green, fr. l. green, seeds shining black; nat. n.: *míndang'a*).

Morotai, Loc. 12, Marilako, riverbank, alt. 20 m, frequent, June 29: *n. 3666* (strongly branched tree, ± 10 m high, lvs. bright green, dull l. green below, petioles and twigs slightly bluish, fr. l. green; nat. n.: *kitòjer*).

Distribution: Celebes, Philippines, Talaud, Moluccas, New Guinea.

Macaranga Mappa (L.) Muell.-Arg. in DC., Prodr. 15, pt. 2, 1866, 1000.

Karakelong, Loc. 7, G. Piapi, Pananasaran'a, open forest, alt. 300 m, June 1: *n. 3299* (tree, 11 m high, bole 9 m, diam. 0.15—0.08 m, trunk straight, cylindrical, gum blood-red, lvs. d. green, with l. yellowish green nerves, fr. l. green; nat. n.: *bináwin'a*).

Distribution: Celebes, ? Philippines, Talaud, Moluccas.

Macaranga Tanarius (L.) Muell.-Arg. in DC., Prodr. 15, 1866, 997.

Karakelong, Loc. 1, sec. forest, alt. 90 m, April 24: *n. 2531* (small straight tree, 6 m high, young twigs bluish by wax, lvs. green, with yellowish green nerves above, slightly pale bluish green below, bracts l. greenish yellow; nat. n.: *binóéng'a*).

Distribution: S. China and Malay Peninsula to Formosa, Philippines, New Guinea and North Australia.

Macaranga ?triloba (Bl.) Muell.-Arg. in DC., Prodr. 15, 1866, 989.

Saleba boe, Loc. 3, old forest, alt. 320 m, frequent, May 23: *n. 3127* (tree, 16 m; nat. n.: *lawéang'a*; used for house and proa construction).

Distribution: Malay Peninsula, Sumatra, Java, Borneo, Palawan, Talaud.

Mallotus ricinoides (Pers.) Muell.-Arg., Linnaea 34, 1865, 187.

Karakelong, Loc. 1, sec. forest, alt. 100 m, April 27: *n. 2645* (small tree, ± 2.5 m high, lvs. l. green, petioles and nerves below very pale, style brown, fr. very l. greenish yellow; nat. n.: *laransiàn'a *oeróéne*).

Distribution: Malay Peninsula to Philippines, New Guinea and N. Australia.

Mallotus tiliifolius (Bl.) Muell.-Arg., Linnaea 34, 1865, 190.

Karakelong, Loc. 1, sec. forest, alt. 10 m, June 5: *n. 3351* (shrub, 1.5 m, infl. l. yellowish green, fr. l. green; nat. n.: *lendeh*).

Distribution: Malay Peninsula and Formosa to Polynesia.

Melanolepis multiglandulosa (Reinw.) Reich. f. & Zoll., Linnaea 28, 1856, 324.

Karakelong, Loc. 1, sec. forest, alt. 80 m, April 24: *n. 2546* (small straight tree, ± 3 m high, lvs. bright green, calyx d. brown pubescent, corolla brown pubescent, fr. green, brown pubescent; nat. n.: *maràm'a*) — Kaboeroeang, Loc. 4, sec. forest, alt. 20 m, May 26: *n. 3184* (widely branched shrub, ± 4 m high, peduncle and calyx brownish green, stigma yellowish green, ovary brownish green, fr. bright green; nat. n.: *naràm'a*) — Nenoesa, Loc. 10, Merampi, G. Maranggi, sec. forest, alt. 130 m, June 13: *n. 3418* (small tree, ± 3 m high, lvs. as in n. 3361, calyx and pedicels brownish green, stigma pale brown, fr. green; nat. n.: *náran*) — Miangas, Loc. 9, G. Batoe, small grove, alt. 70 m, June 11: *n. 3361* (small tree, ± 6 m high, lvs. d. green, paler below, nerves and petioles l. green, stigma greenish brown, ovary green; nat. n.: *nára*).

Distribution: India and China to Formosa and Polynesia.

Pimeleodendron amboinicum (Miq.) Hassk., Versl. Meded. Kon. Akad. Wet. 4, 1855, 140.

Karakelong, Loc. 1, partly cleared old forest, alt. 100 m, April 26: *n. 2614* (tree, 15 m high, bole 5 m, diam. 0.20 m, bark white like that of a birch, with large l. brown spots, bast with yellow gum, calyx and ovary green, stigma yellowish green; nat. n.: *améad'a*) — Loc. 7, G. Piapi, frequent in old forest, alt. 100 m, June 3: *n. 3335* (tree, 11 m high, bole 6 m, diam. 0.30—0.23 m, trunk straight, cylindrical, lvs. shining d. green above, paler below, fr. greenish yellow, more yellow with age; nat. n.: *alóéba*) — Salebaboe, Loc. 3, G. Ajambana, frequent in old forest, alt. 320 m, May 20: *n. 3043* (tree, 11 m high, bole 4 m, diam. 0.12—0.09 m, trunk straight, cylindrical, white, lvs. as in n. 3335, midrib paler, petioles green or brownish, milky-juice little, white, thick and sticky, fr. pale green, with d. brown tip; nat. n.: *malalá'a*).

Distribution: Talaud, Moluccas, New Guinea.

Phyllanthus lamprophyllus Muell.-Arg. in DC., Prodr. 15, 1866, 324.

Karakelong, Loc. 7, G. Piapi, open sunny slope, very frequent, alt. 400 m, May 31: *n. 3279* (densely branched shrub, more lax when growing in shade, lvs. l. green, shining above, corolla greenish white, often slightly red, style and stigma pale yellowish green, fr. l. green or greenish white).

Distribution: Java, Celebes, Palawan, Talaud, Moluccas, Timor, New Guinea.

ANACARDIACEAE

Buchanania amboinensis Miq., Ann. Mus. Bot. Lugd.-Bat. 4, 1868—1869, 117.

Morotai, Loc. 12, old forest, alt. 50 m, June 22: *n. 3537* (tree, 15 m, fr. l. green; nat. n.: *litòko*).

Distribution: N. Celebes, Moluccas, Aroe Islands.

Buchanania arborescens Bl., Mus. Lugd.-Bat. 1, 1850, 183.

Karakelong, Loc. 1, sec. forest, alt. 40 m, June 23: *n. 2577* (tree, 20 m, flow. white; nat. n.: *marísin karéa'a*); cleared old forest, alt. 100 m, April 26: *n. 2617* (tree, 34 m, flow. white, fr. green; nat. n.: *taniroeàn'a*) — Loc. 2, old forest, alt. 200 m, May 9: *n. 2920* (tree, 16 m; nat. n. as n. 2577) — Loc. 7, G. Piapi, open forest, alt. 350 m, June 1: *n. 3292* (tree, 11 m, gum white, sticky; nat. n. as n. 2577) — Nenoesa, Loc. 11, Garete, frequent in cleared forest on limestone, alt. 3 m, June 14: *n. 3441* (tree, 9 m, flow. white; nat. n. as n. 2577).

Distribution: Burma to Soemba, Celebes, Philippines and Talaud.

Campnosperma ?oxyrhachis (Miq.) Engl. in A. DC., Mon. Phan. 4, 1883, 319.

Karakelong, Loc. 2, very frequent in old forest, alt. 40 m, May 3: *n. 2769* (tree, 22 m; nat. n.: *taniroeàn'a*).

Distribution: Malay Peninsula, Sumatra, Talaud.

Dracontomelum dao (Blco.) Merr. & Rolfe, Phil. Journ. Sci. Bot. 3, 1908, 108.

Karakelong, Loc. 2, Pasir Malap, old forest, alt. 25 m, May 14: *n. 3008* (tree, 21 m, flow. white; nat. n.: **lèo'mbáwi*).

Morotai, Loc. 12, on gravelbank in river, alt. 40 m, June 16: *n. 3617* (tree, 20 m; nat. n.: *bemagiohíki*); Marilako, old forest, alt. 20 m, frequent, June 29: *n. 3664* (tree, 30 m, buttresses 4 m high, 3 m spreading, flow. greenish white; nat. n.: *ngámin*).

Distribution: Celebes, Philippines, Talaud, Moluccas.

Koordersiodendron pinnatum (Blco.) Merr., Phil. Bur. For. Bull. 1, 1903, 33.

Karakelong, Loc. 2, riverbank, alt. 40 m, May 11: *n. 2944* (tree, 23 m; nat. n.: *boewís'a*; heartwood in demand for house construction) — Kaboeroeang, Loc. 4, Tonana forest reserve, cleared forest, alt. 25 m, frequent, May 26: *n. 3177* (tree, 18 m; same nat. n. and use as n. 2944).

Distribution: Borneo, Celebes, Philippines, Talaud, Moluccas, New Guinea.

Rhus rufa Teijsm. & Binn., Nat. Tijdschr. N. I. 27, 1863, 52.

Karakelong, Loc. 1, sec. forest, alt. 100 m, April 25: *n. 2572* (tree, 10 m, fr. black; nat. n.: *nanítoe*).

Distribution: Java, Celebes, Talaud, Moluccas, New Guinea, Australia.

AQUIFOLIACEAE

Ilex ?paucinervia Merr., Phil. Journ. Sci. Bot. 17, 1920, 274.

Karakelong, Loc. 7, G. Piapi, open sunny slope, alt. 300 m, May 31: *n. 3257* (shrub, 2 m high, branchlets grey, lvs. coriaceous, yellowish green, pedicels, calyx and fr. l. green).

Distribution: Talaud, Philippines (Luzon).

Remarks: The specimen agrees with Merrill's description but for the upper surface of the leaf, which is not pitted, but glabrous and shining and slightly wrinkled when dry. The base of the leaf, though mostly acute, is sometimes rounded. The leaves measure 2.6—4.8 × 1.3—2.3 cm. For lack of material for comparison we could not identify the specimen with certainty.

CELASTRACEAE

Euonymus javanicus Bl., Bijdr., 1825, 1146.

Salebaboe, Loc. 3, G. Ajambana, old forest, alt. 250 m, May 25: *n. 3169* (tree, 19 m high, bole 9 m, diam. 0.22—0.16 m, trunk straight, cylindrical, l. grey, lvs. shining on both sides, d. green above, l. green below, calyx in fr. brown, pedicels green, fr. shining green; wood used for house construction; nat. n.: *ligisàt'a*).

Distribution: Burma and Malay Peninsula to Philippines and Moluccas.

HIPPOCRATEACEAE

Hippocratea oblongifolia Roxb., Fl. Ind., ed. 1, 1, 1820, 170.

Nenoesa, Loc. 11, Garete, cleared forest on limestone, alt. 5 m, June 14: *n. 3448* (liana, branchlets l. greyish brown, lvs. d. green, calyx and corolla dull green, stigma yellow, ovary green; nat. n.: *poendángi*).

Distribution: India to Philippines and Australia.

STAPHYLEACEAE

Turpinia pomifera (Roxb.) DC., Prodr. 2, 1825, 3.

Karakelong, Loc. 2, old forest, alt. 70 m, May 6: *n. 2855* (tree, 23 m high, bole 11.2 m, diam. 0.37—0.23 m, trunk straight, l. brown, branchlets brown, lvs. shining d. green above, l. green below, petioles, fr. and pedicels l. green; nat. n.: *lampàsia*) — Salebaboe, Loc. 3, G. Ajambana, old forest, alt. 260 m, May 23: *n. 3129* (tree, ± 20 m high, trunk not straight, fr. dirty green).

Distribution: India, China, Malay Peninsula, Formosa, Sumatra, Java, Borneo, Celebes, Philippines, Talaud, Moluccas (Ambon).

ICACINACEAE

Gomphandra australiana F. Muell., Fragm. 6, pt. 3, 1867—1868, 253.

Var. **celebica** Valeton in Koorders, Med. 's Lands Plantent. 19, 1898, 392.

Morotai, Loc. 12, old forest, alt. 60 m, June 21: *n. 3498* (tree, 10 m, fr. greenish white to white; nat. n.: *mòdor*).

Distribution of the variety: Celebes, Talaud; of the species: Celebes, Talaud, New Guinea, Australia.

Gomphandra ?javanica (Miq.) Val., Crit. Overz. Olacin., 1886, 217.

Karakelong, Loc. 2, old forest, alt. 100 m, May 5: *n. 2847* (tree, 16 m, fr. shining greenish white; nat. n.: *anóéwoek'a*).

Distribution: Sumatra, Java, Talaud.

Iodes philippinensis Merr., Phil. Journ. Sci. Bot. 3, 1908, 241.

Kaboeroeang, Loc. 5, forest skirt, alt. 130 m, May 27: *n. 3211* (twining, flow. white).

Distribution: Borneo, Philippines, Talaud.

Iodes ovalis Bl., Bijdr., 1825, 30.

Karakelong, Loc. 2, old forest, alt. 50 m, May 3: *n. 2807* (long liana, flow. greenish white).

Distribution: Sumatra, Java, Borneo, Celebes, Talaud, Moluccas, New Guinea.

Lophopyxis Maingayi Hook. f., Icon. Plant., 1887, t. 1714; Hook. f., Fl. Br. Ind. 5, 1890, 476; Boerl., Handl. Fl. Ned. Ind. 1, 1890, 673; Pax in Engl.-Prantl, Nat. Pflanzenf. 3, pt. 5, 1890, 117; Engl. in Engl.-Prantl, Nat. Pflanzenf. 3, pt. 5, 1893, 257; Hall. f., Meded. 's Rijks Herb. 1, 1910, 9; Ridl., Fl. Mal. Pen. 1, 1922, p. 435 — *Combretopsis pentaptera* K. Schum., Fl. Kais. Wilh. Land, 1889, 69 — *Treubia combretocarpa* Pierre in Boerl., Handl. Fl. Ned. Ind. 1, 1890, 445 — *Lophopyxis Pierrei* Boerl., Handl. Fl. Ned. Ind. 1, 1890, 673; Hall. f., Meded. 's Rijks Herb. 1, 1910, 9 — *L. Schumannii* Boerl., Handl. Fl. Ned. Ind. 1, 1890, 674; Hall. f., Meded. 's Rijks Herb. 1, 1910, 9 — *L. combretocarpa* Engl. in Engl.-Prantl, Nat. Pflanzenf. 3, pt. 5, 1893, 257 — *L. pentaptera* Engl., Sitz.ber. Kön. Preuss. Akad. Wiss., 1893, 265, t. 2, fig. 6, 7; Engl. in Engl.-Prantl, Nat. Pflanzenf.

3, pt. 5, 1893, 257; Schum., Notizbl. Kön. bot. Gart. Mus. Berl. 2, 1898, 130; Schum. & Laut., Fl. Deutsche Schutzgeb. Südsee, 1901, 418; Gilg, Engl. Bot. Jahrb. 55, 1918, 278; Schellenb., Engl. Bot. Jahrb. 58, 1923, 177; Kanehira, Bot. Mag. Tokyo 45, 1931, 293; Kanehira, Fl. Micrones., 1933, 197, fig. 84; Kanehira, Journ. Dept. Agric. Kyushu Imp. Univ. 4, 1935, 358 — *Homalium Gilgianum* Laut., Nachtr. Fl. Deutsche Schutzgeb. Südsee, 1905, 320; Pulle, Nova Guinea 8, 1911, 672; Van Slooten, Bijdr. Combret. Flacourt. Ned. Ind., 1919, 117, 166; Van Slooten, Nova Guinea 14, 1924, 194.

Karakelong, Loc. 2, Pasir Malap, bank of K. Bahewa, alt. 20 m, frequent, May 14: *n. 3014* (liana, several m long, branchlets brown, lvs. bright green, peduncles and calyx l. green, filaments white, anthers brownish white, stigma white, ovary greenish white, young fr. l. green; nat. n.: *tabóéroe*).

Distribution: Malay Peninsula (Perak, Malacca), Talaud, Moluccas (Ceram, Ambon), Micronesia (Palau), S.W. New Guinea (along the Lorentzriver = Noordriver), N.E. New Guinea (Torricelli mountains; Gogolriver; near Constantinhafen; Cape Arcona, Huon Gulf), New Britain and probably New Ireland. Gilg (1918) mentioned a specimen collected by Peckel, but did not give the locality; probably this specimen came from New Ireland, since Peekel collected most of his material there.

Remarks: Formerly this remarkable genus was supposed to consist of three species, viz. *L. Maingayi* Hook f. from the Malay Peninsula, *L. pentaptera* (K. Schum.) Engl. from the Moluccas, Micronesia and New Guinea, and *L. combretocarpa* (Pierre) Engl. from Ceram. On comparing these three species we could not find any sufficient differences to keep them separate.

The type material of *L. combretocarpa*, which ought to be in the Rijksherbarium (vid. Boerlage, 1890 and Hallier, 1910) could not be traced there any longer; only the drawing by Pierre, mentioned by Boerlage (p. 446) was at our disposal (cf. *Fig. 7*; the specific name has erroneously been spelled *combreticarpa*). Boerlage (p. 674) states as differences between *L. Schumannii* (= *L. pentaptera*) and *L. Pierrei* (= *L. combretocarpa*), that in *L. Pierrei* the fruits are smaller and the tendrils absent. In Pierre's drawing the fruit measures 2.4 cm in natural size. Schumann gives as the size of the fruits of his specimen 2.5—3.5 cm. This difference seems to small to be of much importance, the more so as it is not certain that the fruits of Pierre's specimen were fully ripe. As to the second point, the presence or absence of tendrils, this is certainly not a character to base a specific difference upon. In the material from Talaud, for instance, there are eight branches bearing inflorescences, seven of which possessed no tendrils at all, the eight being provided with two kinds of tendrils, namely, axillary branches metamorphosed into strong tendrils, which are rolled up only at the end, often bearing a bud, and bracts at the base of the inflorescences metamorphosed into weak flat tendrils, which are curved over their whole length and are probably without function ¹).

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¹) These two kinds of tendrils are also apparent in Hooker's figure.

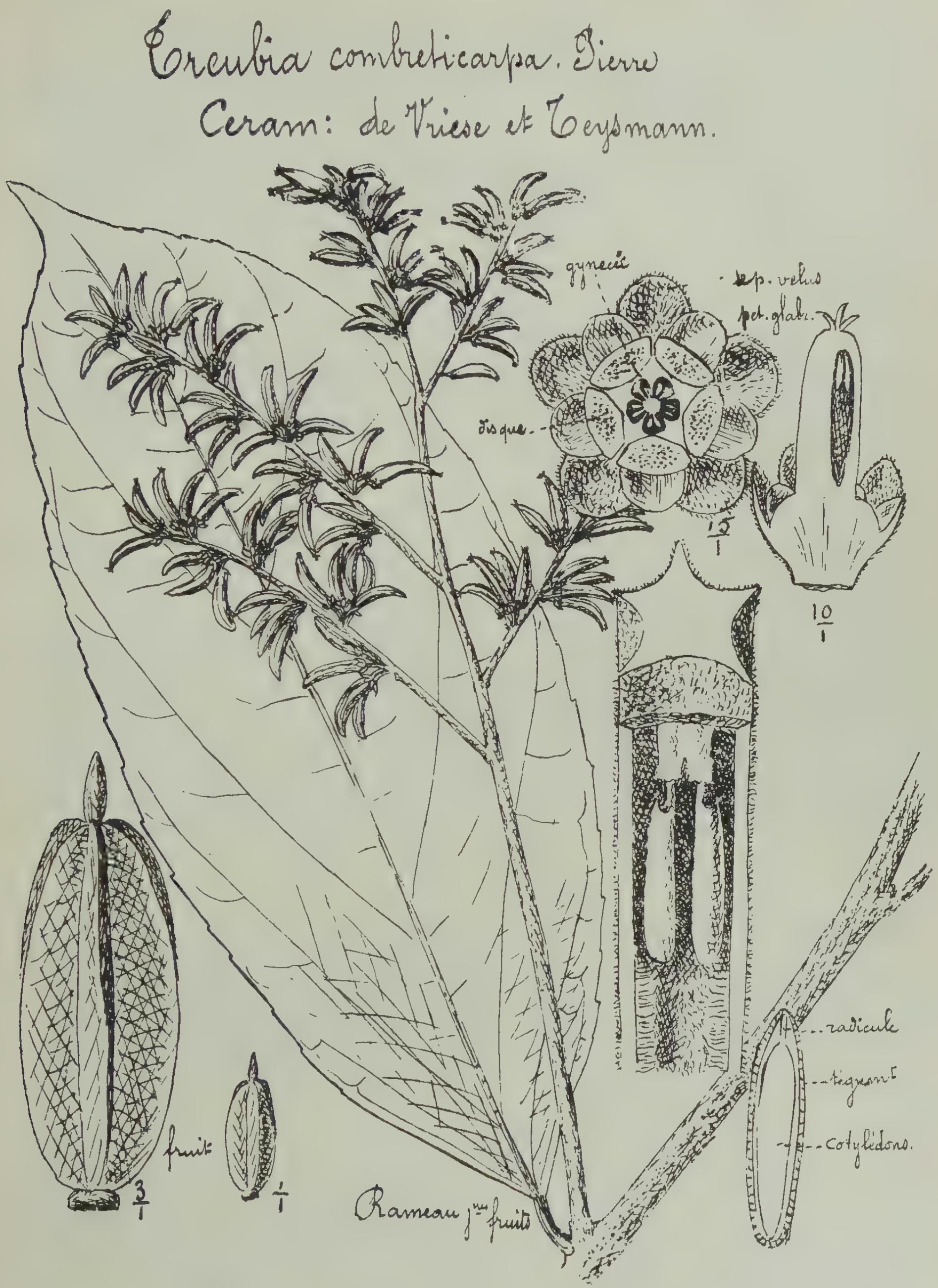

Fig. 7 — *Lophopyxis Maingayi* Hook. f. — about 5/6 the size of the original reproduction of Pierre's plate, extant in the Rijksherbarium.

Moreover, Hallier (1910) stated these two kinds of tendrils together in the original specimens of *L. Pierrei* (= *L. combretocarpa*)!

The only difference between *L. Maingayi* and *L. pentaptera* we could find is that in *L. Maingayi* the petals and the stamens are more pubescent than in *L. pentaptera*, but we had not enough material at our disposal to state whether this difference is constant. Also Boerlage pointed out that there is no difference in the form of the gynaeceum of *L. Maingayi* and of *L. Pierrei.* As differences between the two species, he mentions that *L. Maingayi* has leaves with entire margins and a rounded base, *L. Pierrei,* however, leaves with serrate margins and an acute base. Though Hooker pictures the margins of the leaves entire, we found them distinctly serrate in the specimens of *L. Maingayi* in the collection of the Rijksherbarium, the leaf-bases in all these specimens being rounded. The specimens of *L. pentaptera* examined had the leaf-bases rounded to acute with all transitions between the extremes. Schumann also mentions in his description of *Combretopsis pentaptera*: "basi rotundatis obtusis rarius acutis".

For these reasons we deemed it justified to unite the three species into a single one which has to bear the name of *Lophopyxis Maingayi* Hook f. It is, however, desirable that this conclusion be supported by an investigation of more complete material.

The place of the genus in the system is subject to various different opinions. Hallier considered it to belong to the *Euphorbiaceae,* to which family it was put also, though with some doubt, by J. D. Hooker and by Pax; Lauterbach and Pulle regarded it as a species of *Homalium* (*Flacourtiaceae*); Schumann and Boerlage inserted it in the *Olacaceae,* Ridley, in his Flora of the Malay Peninsula, placed it in the *Olacineae,* Pierre put it to the *Saxifragaceae.* At present it is usually considered to belong to the *Icacinaceae* (Engler, Gilg, Schellenberg, Kanehira).

SAPINDACEAE

Allophylus Cobbe Bl., Rumphia 3, 1847, 131.

Karakelong, Loc. 1, sec. forest, alt. 10 m, April 23: *n. 2505* (widely branched shrub, 4 m high, calyx, anthers and filaments l. green, corolla greenish yellow, fr. green; nat. n.: *dàrat'a*) — Kaboeroeang, Loc. 4, sec. forest, alt. 10 m, May 26: *n. 3182* (large shrub, ± 4 m high, branchlets d. brown, lvs. d. green above with paler midrib, calyx l. green, almost white with age; nat. n.: *araríntok'a*) — Nenoesa, Loc. 10, Merampi, near Dampoelis, on limestone terrace, slope, alt. 30 m, June 13: *n. 3428* (small tree, ± 3 m high, branchlets l. greyish brown, lvs. l. green, pedicels and buds greenish white; nat. n.: *arámpoe*) — Miangas, Loc. 9, grove on G. Kota, alt. 90 m, June 11: *n. 3378* (small tree, ± 3 m high, lvs. bright green, infl. l. green; nat. n.: *aràpoe*).

Distribution: S.E. Asia to Australia and Polynesia.

Allophylus sumatranus Bl., Rumphia 3, 1847, 132.

Morotai, Loc. 12, riverbank, alt. 40 m, June 26: *n. 3627* (small tree, 4 m; nat. n.: *tioa*); old forest, alt. 10 m, fairly frequent, June 30: *n. 3680* (shrub, fr. red).

Distribution: Sumatra, Java, Borneo, Moluccas (Obi, Batjan, Morotai).

Harpullia cupanioides Roxb., Fl. Ind., ed. 2, 1, 1832, 645.

Morotai, Loc. 12, Marilako, alt. 20 m, old forest, June 28: *n. 3656* (small tree, 1.5 m, cauliflorous, flow. white).

Distribution: India and S. China to Philippines and New Guinea.

Jagera serrata (Roxb.) Radlk., Sitz. Ber. Math.-Phys. Ac. Münch. 8, 1878, 303.

Morotai, Loc. 12, Marilako, old forest, alt. 20 m, June 29: *n. 3674* (tree, 10 m, flow. yellowish white; nat. n.: *hokaróéboe*).

Distribution: Moluccas (Ambon, Ceram, Boeroe, Morotai).

Otophora fruticosa (Roxb.) Bl., Rumphia 3, 1847, 142.

Karakelong, Loc. 2, Pasir Malap, old forest, alt. 30 m, May 13: *n. 2981* (small tree, 3 m, fr. yellowish red).

Distribution: Siam to Philippines and Moluccas.

Pometia pinnata Forst., Char. Gen., 1776, 109, t. 55.

Karakelong, Loc. 2, old forest, alt. 70 m, frequent, May 6: *n. 2852* (tree, 23 m, buttresses 3 m, young lvs. red; nat. n.: *lóétoet'a*).

Distribution: Malay Peninsula to Polynesia.

Pometia tomentosa (Bl.) Teijsm. & Binn., Cat. Hort. Bog., 1886, 214.

Saleb aboe, Loc. 3, old forest, alt. 260 m, May 23: *n. 3128* (lofty tree, 30 m; nat. n.: *lèo*; wood used for proa construction).

Distribution: Java, Borneo, Philippines, Talaud, Ambon, Timor.

RHAMNACEAE

Alphitonia zizyphoides (Spreng.) A. Gray, U. S. Expl. Exp. Bot., 1854, 278.

Karakelong, Loc. 1, partly cleared old forest, alt. 120 m, April 27: *n. 2651* (tree, 17 m high, bole 14.5 m, diam. 0.19—0.09 m, trunk slightly curved, bark greenish brown, spotted, lvs. d. green above, almost white below, with l. greenish brown nerves; nat. n.: **tóleh*) — Loc. 7, G. Piapi, open sunny slope, alt. 400 m, May 31: *n. 3276* (small tree, 3 m high, trunk greyish white, lvs. shining d. green above, very l. green with darker nerves and l. yellowish green midrib below, pedicels and calyx ferruginously pubescent, corolla, stamens and gynaeceum greenish white, fr. d. brown, seeds d. red) — Salebaboe, Loc. 3, G. Ajambana, very frequent in old forest, alt. 250 m, May 22: *n. 3102* (tree, 23 m high, bole 18 m, diam. 0.30—0.20 m, bark greyish brown, bast red, fr. black, with red pericarp; nat. n.: **tóleh*).

Distribution: Borneo, Celebes, Philippines, Talaud, Moluccas, New Guinea, Australia, Polynesia.

Colubrina asiatica (L.) Brongn., Ann. Sci. Nat. Bot., Sér. I, 10, 1827, 369.

Miangas, Loc. 9, beach, frequent, alt. 2 m, June 12: *n. 3402* (shrub, more or less climbing, ± 3 m high, lvs. shining d. green above, pedicels, calyx and fr. green; nat. n.: *angkaráha*).

Distribution: paleotropic.

VITACEAE

Cissus hastata (Miq.) Planch. in A. DC., Mon. Phan. 5, 1887, 502.

Karakelong, Loc. 1, cleared old forest, alt. 30 m, April 25: *n. 2603* (long liana, fr. dirty brownish red with bright red pedicels; nat. n.: *apobóéroe'a*) — Loc. 2, riverbank, alt. 50 m, May 2: *n. 2743* (liana, flow. red and yellow, fr. dirty red).

Distribution: Indo China and Malay Peninsula to Celebes, Philippines and Talaud.

Cissus nodosa Bl., Bijdr., 1825, 182.

Karakelong, Loc. 2, frequent along riverbank, alt. 40 m, May 12: *n. 2970* (climbing, ± 5 m long, fr. green; nat. n.: *landèrong*).

Distribution: Sumatra, Java, Borneo, Celebes, Talaud.

Columella corniculata (Benth.) Merr., Phil. Journ. Sci. Bot. 11, 1916, 133.

Karakelong, Loc. 2, N. Maraloem, alt. 5 m, May 16: *n. 3038* (climbing, flow. greenish white; nat. n.: *aoeríta*) — Salebaboe, Loc. 3, skirt of sec. forest, alt. 100 m, May 12: *n. 3054* (entire plant l. green).

Distribution: S. China, Formosa, Philippines, Talaud.

Leea ?aculeata Bl., Bijdr. 1825, 197.

Karakelong, Loc. 2, very frequent along riverbank, alt. 50 m, May 1: *n. 2729* (overhanging tree, 3 m, flow. l. green, young fr. dull dirty green; nat. n.: *mamáli*).

Distribution: Sumatra, Java, Borneo, Celebes, Philippines, Talaud, Moluccas.

Leea acuminata Clarke, Journ. Bot. 19, 1881. 102.

Salebaboe, Loc. 3, frequent in sec. forest, alt. 100 m, May 21: *n. 3074* (small tree, 7 m, infl. red, flow. buds greenish; nat. n.: *mamáli *wawine*) — Kaboeroeang, Loc. 4, very frequent in sec. forest, alt. 10 m, May 26: *n. 3183* (small tree, 5 m; nat. n.: *mamáli *ésak'a*).

Distribution: Malay Peninsula, Sumatra, Java, Borneo, Talaud, Moluccas.

Leea indica (Burm. f.) Merr., Phil. Journ. Sci. Bot. 14, 1919, 245.

Morotai, Loc. 12, Marilako, frequent in old forest, alt. 20 m, June 29: *n. 3667* (large shrub, 6 m, flow. l. green, fr. dirty violet; nat. n.: *ngetéda*).

Distribution: India, S. China, Sumatra, Java, Borneo, Philippines, Talaud, Moluccas.

Leea javanica Bl., Bijdr., 1825, 197.

Karakelong, Loc. 1, sec. forest, alt. 75 m, April 24: *n. 2539* (shrub, 2.5 m, flow. yellowish white; nat. n.: *mamáli*); in coconut plantation, alt. 100 m, April 25: *n. 2579* (shrub, 2 m, fr. pink; same nat. n. as n. 2539).

Distribution: Malay Peninsula, Sumatra, Java, Borneo, Celebes, Philippines, Talaud, New Guinea.

ELAEOCARPACEAE

Elaeocarpus ?dolichostylus Schlecht., Engl. Jahrb. 54, 1916, 125.

Karakelong, Loc. 1, cleared old forest, alt. 100 m, very frequent, April 26: *n. 2611* (tree, 25 m, old leaves red, fr. green; nat. n.: *antoála*; wood used for house construction).

Distribution: New Guinea, Talaud.

Elaeocarpus Ganitrus Roxb., Fl. Ind. ed. 2, 2, 1832, 592.

Morotai, Loc. 12, riverbank, alt. 25 m, frequent, June 27: *n. 3632* (tree, 20 m, fr. blue; nat. n.: *máleh-máleh*).

Distribution: Siam to New Caledonia (not in Philippines).

Elaeocarpus ?gigantifolius Elm., Leafl. Phil. Bot. 4, 1911, 1182.

Morotai, Loc. 12, old forest, alt. 100 m, June 21: *n. 3507* (small tree, 6 m, flow. l. pink, fetid [carrion odour]).

Distribution: Philippines (Leyte, Mindanao), Morotai.

Elaeocarpus multiflorus (Turcz.) F.-Vill., Noviss. App., 1880, 31.

Nenoesa, Loc. 11, Garete, cleared forest, alt. 5 m, June 14: *n. 3444* (tree, 16 m, flow. white; nat. n.: *antoála*; wood used for proa construction).

Distribution: N. Celebes, Philippines, Talaud.

TILIACEAE

Brownlowia Beccarii (Mast.) Pierre, Fl. For. Cochinch., 1888, sub. t. 130.

Karakelong, Loc. 1, high mangrove forest, alt. 1 m, April 23: *n. 2491* (shrub, lvs. d. green above, dull brownish green below, fr. dull greenish brown).

Distribution: Borneo, Celebes, Talaud.

Colona scabra (Sm.) Burrett, Notizbl. Bot. Gart. Berlin 9, 1926, 729, 800.

Karakelong, Loc. 2, bank of K. Bahewa, alt. 20 m, May 16: *n. 3033* (tree, 11 m high, bole 4 m, diam. 0.20—0.11 m, trunk curved, greyish brown, lvs. d. green above, l. green below, l. ferruginously pubescent, calyx and pedicel greenish, ferruginously pubescent, corolla dirty pink, filaments l. yellowish red, anthers very d. red, fr. dull greyish brown; wood used for house construction; nat. n.: *anít'a*) — Salebaboe, Loc. 3, G. Ajambana, sec. forest, alt. 150 m, May 20: *n. 3041* (tree, 13 m high, bole 6 m, diam. 0.30—0.24 m, fr. dirty brownish green; nat. n.: *anít'a*); south of Liroeng, very frequent in cleared old forest, alt. 100 m, May 21: *n. 3076* (tree, 18.4 m high, bole 10.2 m, 0.44—0.30 m, trunk straight, knobby; further same annotations as n. 3033, but filaments d. red, pink at base, anthers yellow, margins and connective d. red, style greenish white, stigma l. pink, ovary l. green, fr. dirty greenish red; nat. n.: *anít'a*).

Distribution: Celebes, Talaud, Moluccas.

Colona serratifolia Cav., Ic. 4, 1797, 47, t. 370.

Morotai, Loc. 12, old forest, alt. 200 m, June 23: *n. 3566* (tree, 17 m high, bole 6 m, diam. 0.35—0.30 m, trunk curved, d. greenish grey, lvs. ± shining d. green above, dull pale green below, nerves l. brown, calyx dirty yellowish ~~red~~ without, red with dirty yellowish red margins within, corolla yellow and red, filaments l. yellow, anthers yellow, margins d. red; bast used for the construction of "paloedi" baskets used for carrying gum copal; nat. n.: *gibakolàno*).

Distribution: Borneo, Philippines, Celebes, Morotai.

Corchorus acutangulus Lam., Enc. Bot. 2, 1786, 104.

Karakelong, Loc. 8, north of Poeloetan, wayside, alt. 5 m, June 4: *n. 3344* (herb or undershrub, branchlets spreading, lvs. dull green, paler below, midrib greenish white below, petioles and branchlets reddish, calyx and pedicel reddish, corolla, stamens and stigma yellow, style yellowish green, ovary green; dogs, which are used for boar hunting are feeded with the flowers; a decoction of the leaves is used as a febrifuge; nat. n.: *loempánsit'a*).

Distribution: pantropic.

Grewia ceramensis Hochr., Pl. Bogor. Exsicc., 1904, 30.

Morotai, Loc. 12, G. Ligòjer near Goegoeti, old forest, alt. 60 m, June 24: *n. 3580* (tree, 15 m high, bole 9 m, diam. 0.33—0.25 m, trunk straight, cylindrical, lvs. d. green above, petioles brown, fr. l. green, persistent calyx and pedicels l. brown; nat. n.: *ngodóro*).

Distribution: Moluccas (Soela, Boeroe, Morotai, Ceram, Ambon).

Trichospermum eriopodum (Turcz.) Merr., Phil. Journ. Sci. Bot. 11, 1916, 17.

Karakelong, Loc. 2, Pasir Malap, old forest, alt. 40 m, May 13: *n. 2983* (tree, 14 m high, bole 9 m, diam. 0.25—0.19 m, trunk d. brown, lvs. dull green, l. dirty violet when young; nat. n.: *siàpoe*) — Salebaboe, Loc. 3, G. Ajambana, old forest, alt. 250 m, May 22: *n. 3105* (tree, 17 m high, bole 12 m, diam. 0.17—0.09 m, trunk curved, bark l. grey, bracts l. green, calyx ferruginously pubescent, pedicels greenish brown, corolla dull d. violet, filaments l. greenish yellow, anthers yellowish brown; strips of the bast are used for binding purposes; nat. n.: *siàpoe*).

Distribution: Philippines, Talaud.

Triumfetta procumbens Forst. f., Prodr., 1786, p. 35.

Miangas, Loc. 9, beach, alt. 1 m, June 11: *n. 3366* (creeping shrub, lvs. l. green, calyx l. greenish yellow, corolla and stamens bright yellow, style and stigma yellow, fr. d. brown) — Nenoesa, Loc. 11, Garete, beach, June 14: *n. 3450* (creeping undershrub, same annotations, but fr. l. green; nat. n.: *anggaliára*).

Distribution: Seychelles to Polynesia.

MALVACEAE

Abelmoschus Manihot (L.) Médic., Malv., 1787, 46.

Forma **leptodactylus** Bakh. in Ochse, Ind. Groenten, 1931, 469, fig. 292.

Miangas, Loc. 9, cultivated: *n. 3364* (nat. n.: *natíng'a* [Tal.] or *lóro* [Malay]; leaves are eaten boiled as vegetables).

Distribution: a native of China, now cultivated in all tropical countries.

Abelmoschus moschatus Médic., Malv., 1787, 46.

Karakelong, Loc. 1, wayside: *n. 2480* (erect shrub, 1.5 m, flow. reddish yellow, fr. green, slightly red; nat. n.: *dandí'it*).

Distribution: pantropic.

Hibiscus tiliaceus L., Sp. Pl., 1753, 694.

Karakelong, Loc. 2, very frequent along riverbank: *n. 3029* (curved tree, flow. yellowish red with d. violet centre; nat. n.: *bároe*; bast used for making ropes).

Distribution: pantropic.

STERCULIACEAE

Commersonia Bartramia (L.) Merr., Interpret. Herb. Amb., 1917, 362.

Karakelong, Loc. 1, sec. forest, alt. 100 m, very frequent, April 24: *n. 2525* (small tree, 2.5 m high, corolla white, stamens l. brown, stigma white, fr. l. green, brown with age; nat. n.: *sansoearàn*) — Kaboeroeang, Loc. 4, sec. forest, May 26: *n. 3187* (large shrub, ± 4 m high, lvs. d. green above, l. green below, nerves ferruginously pubescent, corolla white, filaments white, anthers l. brown, stigma greenish white, fr. l. greenish brown; nat. n.: *sansoearàn'a*) — Miangas, Loc. 9, G. Soro, open grass-slope, alt. 50 m, June 11: *n. 3382* (small shrub, 0.5 m high, calyx dirty greyish green, corolla creamy white, stamens l. yellow, fr. dirty greyish green; nat. n.: *ansoeár'a*).

Distribution: Malay Peninsula and S. China to Polynesia.

Kleinhovia hospita L., Sp. Pl., ed. 2, 1763, 1365.

Kaboeroeang, Loc. 4, skirt of sec. forest, alt. 10 m, May 26: *n. 3188* (shrub, 2.5 m high, lvs. d. green above, paler below with greenish white nerves, calyx dirty pink, corolla pink, filaments l. yellow, anthers yellowish brown, fr. l. greenish brown; nat. n.: *andénak'a*).

Morotai, Loc. 12, Marilako, old forest along river, alt. 20 m, frequent, June 28: *n. 3639* (tree, ± 10 m high, with dense foliage, calyx and corolla pink without, almost white within, tips of petals white, filaments white, red at top, anthers brownish white, fr. dirty l. greenish brown; nat. n.: *dédoro*).

Distribution: paleotropic.

Melochia concatenata L., Sp. Pl., 1753, 675.

Salebaboe, Loc. 6, Lota swamp near Moronge, alt. 5 m, May 28: *n. 3221* (herb or undershrub, lvs. dull green, calyx and bracts l. green, corolla pink, fr. l. green).

Distribution: pantropic.

Melochia umbellata (Houtt.) Stapf, Kew Bull., 1913, 317.

Karakelong, Loc. 1, sec. forest, alt. 30 m, April 25: *n. 2570* (small tree, 5 m high, lvs. l. green, nerves yellowish green, fr. dry, brown; nat. n.: *bambak'a*).

Distribution: Mascarenes and tropical Asia to Philippines, Moluccas, Lesser Sunda Islands and Polynesia.

Pterospermum celebicum Miq., Illustr. Fl. Arch. Ind., 1870, 87.

Karakelong, Loc. 2, Pasir Malap, old forest on riverbank, alt. 20 m, very frequent, May 14: *n. 3009* (tree, 25.6 m high, bole 20 m, diam. 0.60—0.30 m, trunk cylindrical, greyish brown, lvs. d. green above, l. brown with darker nerves below, pedicels brownish green, calyx brownish green without, white within, corolla white, filaments, style and stigma white, anthers very l. brown, fr. brown; nat. n.: *wáloek'a*) — Salebaboe, Loc. 3, G. Ajambana, old forest, alt. 250 m, frequent, May 22: *n. 3103* (tree, 27 m high, bole 20 m, diam. 0.32—0.20 m, trunk l. greyish brown, bast red, flow. slightly fragrant, buds d. brown, calyx greenish white; wood used for house and proa construction; nat .n.: *báloek'a*).

Distribution: Celebes, Talaud.

Sterculia ceramica R. Br. in Benn., Pl. Jav. Rar., 1844, 233.

Nenoesa, Loc. 11, Garete, cleared forest on limestone, alt. 2 m, June 14: *n. 3443* (tree, 4 m high, bole 3 m, diam. 0.14—0.12 m, lvs. l. green, nerves at lower surface and petioles greenish white, flow. with pink galls; nat. n.: *lóéi*).

Distribution: Celebes, Philippines, Talaud, Moluccas.

Sterculia comosa Wall., Pl. As. Rar. 2, 1831, 25, t. 127.

Miangas, Loc. 9, open grass slope, alt. 30 m, June 11: *n. 3362* (strongly curved branched tree, ± 6 m high, lvs. d. green, nerves and petioles l. yellowish green, peduncles l. green, pedicels red, calyx dirty violet red, fr. reddish; nat. n.: *lawéa*).

Distribution: Celebes, Talaud, Ambon.

Remark: The specimen agrees with Wallich's figure, description and type specimens in all respects but for the lower surface of the leaf, which is not glaucescent tomentose but glabrous.

Sterculia Treubii Hochr., Bull. Inst. Bot. Buitenzorg 19, 1904, 20.

Karakelong, Loc. 1, partly cleared old forest, alt. 100 m, April 26: *n. 2624* (tree, 20 m high, bole 4 m, diam. 0.45 m, bark l. brown, wood with clear l. brown resin, lvs. bright green, nerves yellowish below, calyx l. greenish yellow, base red within, filaments l. green, anthers l. brown, fr. dull green; nat. n.: *amómas'a*) — Loc. 2, frequent in old forest, alt. 250 m, May 8: *n. 2905* (tree, 28 m high, bole 9 m, diam. 0.56—0.44 m, trunk straight, cylindrical, bark greyish green with white spots, lvs. bright green, shining above, lower surface and nerves paler, fr. green when young, red with age, up to 6-seeded; seeds are eaten roasted; nat. n.: *amómas'a*).

Distribution: Talaud, Ambon.

OCHNACEAE

Schuurmansia Theophrasta Hall. f., Rec. Trav. bot. néerl. 10, 1913, 347.

Karakelong, Loc. 2, frequent in old forest, alt. 100 m, May 11: *n. 2946* (small tree, 7 m, young leaves d. brownish red, bud scales l. green; nat. n.: *arisóésoe* **oeróéne*).

Distribution: Talaud, Moluccas, New Guinea.

GUTTIFERAE

Calophyllum Inophyllum L., Sp. Pl., 1753, 513.

Karakelong, Loc. 7, G. Piapi, open slope, alt. 400 m, very frequent, May 31: *n. 3263* (curved tree, 6 m, fr. dull d. bluish violet, almost black; nat. n.: *bitáwak'a*).

Distribution: E. Africa to Polynesia.

Calophyllum soulattri Burm. f., Fl. Ind., 1768, 121.

Karakelong, Loc. 2, old forest, alt. 200 m, fairly frequent, May 10: *n. 2925* (tree, 28 m; nat. n.: *bitáwat'a*).

Morotai, Loc. 12, frequent in old forest, alt. 180 m, June 23: *n. 3567* (tree, 25 m, milky juice white, little; nat. n.: *fitàko*; trunk much in demand for ships' masts).

Distribution: Mascarenes to Philippines and Moluccas.

Garcinia cornea L. in Murr., Syst., ed. 13, 1774, 368.

Karakelong, Loc. 7, G. Piapi, open forest, alt. 300 m, June 2: *n. 3309* (tree, 10 m, milky juice white; nat. n.: *panggamóéil'a*).

Distribution: Mauritius, India and Siam to Borneo, Celebes, Talaud and Moluccas.

Garcinia Morella Desr. in Lam., Enc. Bot. 3, 1789, 701.

Karakelong, Loc. 2, very frequent in old forest, alt. 60 m, May 4: *n. 2826* (tree, 12.5 m, milky juice white, very sticky, fr. yellow with d. brown apex; nat. n.: *boelíta* or *boeríta*).

Distribution: India, Indo China, Malay Peninsula, Sumatra, Java, Philippines, Talaud.

Garcinia rhizophoroides Elm., Leafl. Phil. Bot. 3, 1911, 1049.

Karakelong, Loc. 7, G. Piapi, low forest, alt. 500 m, June 1: *n. 3288* (small tree, 5 m, milky juice yellow, sticky, flow. yellowish green, fragrant; nat. n.: *boeríta*).

Distribution: Talaud, Philippines (Leyte, Sibuyan, Luzon).

Garcinia sizygifolia Pierre, Fl. For. Cochinch. 5, 1883, 26, pl. 77.

Karakelong, Loc. 1, sec. forest, alt. 80 m, April 25: *n. 2564* (tree, 7 m, milky juice yellow, very sticky, flow. fragrant; nat. n.: *boeríta*).

Distribution: Sumatra, Borneo, Talaud, Moluccas, New Guinea.

Garcinia tetrandra Pierre, Fl. For. Cochinch. 1, 1889, 20, t. 94, fig. D.

Nenoesa, Loc. 10, Merampi, sec. forest, alt. 50 m, June 13: *n. 3426* (small tree, 6 m, flow. bright red, fr. edible; nat. n.: *la'tsi*).

Distribution: Celebes, Talaud, Philippines.

DIPTEROCARPACEAE (D. F. van Slooten)

Anisoptera costata Korth., Verh. Nat. Gesch. Ned. Overz. Bez., Bot. 67, 1839—'42, tab. 6, fig. 1—9; Van Slooten, Bull. Jard. bot. Buit., Sér. III, 8, 1926, 7, fig. 1.

Morotai, Loc. 12, fairly frequent in old forest, alt. 130 m, June 22: *n. 3533* (lofty tree, 30 m high, bole 19 m, diam. 0.45—0.30 cm, trunk straight, cylindrical, branchlets greyish green, lvs. green, the nerves lighter; nat. n.: *bólam*).

Distribution: Malay Peninsula, Sumatra, Borneo, Morotai.

Vatica papuana Dyer, Journ. of Bot. 16, 1878, 100; Van Slooten, Bull. Jard. bot. Buit., Sér. III, 9, 1927, 112.

Morotai, Loc. 12, frequent in old forest, alt. 100 m, June 21: *n. 3504* (tree, 20 m high, bole 11 m, diam. 0.30—0.20 m, lvs. l. green, paler below, petioles brownish green, branchlets often with a fungus-gall; nat. n.: *íroe*).

Distribution: Borneo, Philippines (Tawi-Tawi), Moluccas (Morotai, Obi, Batjan, Ambon), New Guinea.

VIOLACEAE

Rinorea amboinensis Merr., Phil. Journ. Sci. Bot. 11, 1916, 292.
Karakelong, Loc. 2, old forest, alt. 250 m, May 8: *n. 2902* (tree, 7 m; nat. n.: *malètah*).
Distribution: ? Sumatra, Talaud, Ambon.

FLACOURTIACEAE

Homalium foetidum (Wall.) Benth., Journ. Linn. Soc. Bot. 4, 1860, 35.
Morotai, Loc. 12, old forest, alt. 50 m, June 21: *n. 3497* (tree, 20 m, bole 14 m, diam. 0.30—0.20 m, trunk straight, cylindrical, lvs. bright green, entire infl. [in bud] l. green; nat. n.: *atébeh*).
Distribution: Borneo, Celebes, Moluccas, New Guinea.

Osmelia philippina (Turcz.) F.-Vill., Noviss. App., 1880, 93.
Morotai, Loc. 12, old forest, alt. 200 m, June 23: *n. 3570* (shrub ± 2.5 m high, branchlets greyish brown, lvs. d. green, infl. l. green; nat. n.: *móétingóéti*).
Distribution: Philippines, Morotai, New Guinea.

Scolopia ?spinosa (Roxb.) Warb. in Engl.-Prantl, Nat. Pflanzenf. 3, pt. 6a, 1893, 29.
Kaboeroeang, Loc. 4, Lapean'a forest reserve, frequent in cleared old forest, alt. 75 m, May 26: *n. 3174* (tree, 14 m high, bole 9 m, diam. 0.34—0.23 m, trunk straight, cylindrical, greyish brown, branchlets brown, lvs. shining at both sides, slightly darker above; wood used for house construction; nat. n.: *boenároh*).
Distribution: S. China, Malay Peninsula, Sumatra, Java, Borneo, Palawan, Talaud.

PASSIFLORACEAE

Adenia pandurata Hall. f., Meded. 's Rijks Herb. 42, 1922, 12.
Karakelong, Loc. 2, old forest, alt. 250 m, May 10, *n. 2934* (climbing, entirely l. green); bank of K. Bahewa, Pasir Malap, alt. 20 m, May 14: *n. 3015* (climbing, some m long, lvs. rather d. green above, midrib paler, paler below with darker nerves, buds and fr. l. green; nat. n.: *sasaríwoe*); same locality and date: *n. 3016* (climbing, several m long, fr. yellow and green, slightly orange at apex; nat. n.: *tatanároe waráwoh*).
Distribution: Talaud, S.W. New Guinea.

Passiflora foetida L., Sp. Pl., 1753, 959.
Kaboeroeang, Loc. 4, common on open grounds, alt. 60 m, May 26: *n. 3193* (climbing and creeping herb, some m long, lvs. d. green, dull above, shining below, calyx l. green, corolla white, fr. yellow, orange in maturity, with sweet tasting arillus; nat. n.: *manisàn'a*).
Distribution: pantropic.

DATISCACEAE

Octomeles sumatrana Miq., Fl. Ind. Bat., suppl., 1861—'62, 336.

Morotai, Loc. 12, Marilako, frequent in old forest, alt. 20 m, June 28: *n. 3634* (lofty straight tree, 40 m high, bole 28 m, diam. 1.20—0.5 m, trunk brown, cylindrical, buttresses 3 m spreading and 4 m high, lvs. d. green above, l. green below, filaments greenish white, anthers l. brown, young fr. dull green; nat. n.: *dadátoko* [Alifuru] or *salawàkoe* [Malay]).

Distribution: Sumatra, Borneo, Celebes, Philippines, Moluccas, Timor, New Guinea, Bismarck Archipelago.

Remark: Specimens with a height of ± 60 m are not rare; the buttresses may be 4 m spreading and 8 m high.

THYMELAEACEAE

Gyrinopsis Cumingiana Decne, Ann. Sci. Nat., Sér. II, 19, 1843, 41.

Morotai, Loc. 12, old forest, alt. 130 m, June 22: *n. 3539* (small tree, 3.5 m, cauliflorous; nat. n.: *bòkoein*).

Distribution: Celebes, Philippines, Morotai.

Phaleria urens (Reinw.) Koord., Med. 's Lands Plantent. 19, 1898, 577.

Karakelong, Loc. 2, old forest, alt. 60 m, April 30: *n. 2702* (tree, 9 m, cauliflorous, flow. white, nat. n.: *la'awàn'a*).

Distribution: Java, Celebes, Talaud.

Wikstroemia indica (L.) C. A. Mey., Bull. Ac. Petersb. 1, 1843, 357.

Karakelong, Loc. 7, G. Piapi, open sunny slope, alt. 250 m, very frequent, June 2: *n. 3315* (shrub, 0.5—0.2 m; nat. n.: **peràpat'a* [Tal.] or *posi-posi* [Manado Malay]).

Distribution: India, S. China and Formosa to Philippines and New Guinea.

LYTHRACEAE

Pemphis acidula Forst., Char. Gen., 1776, 68, t. 34.

Miangas, Loc. 9, beach, alt. 3 m, frequent, June 12: *n. 3413* (shrub, ± 2 m high, lvs. bright green, calyx, pedicels and filaments l. green, anthers l. yellow; nat. n.: *ngíra*).

Distribution: paleotropic.

SONNERATIACEAE

Duabanga moluccana Bl., Mus. Bot. Lugd.-Bat. 2, 1856, 109.

Karakelong, Loc. 2, frequent in old forest, alt. 60 m, May 1: *n. 2723* (lofty tree, 41 m high, bole 28 m, diam. 0.61—0.31 m, trunk straight, l. brown, lvs. bright green, pedicels and calyx green, corolla, filaments and style greenish white, anthers brownish white, stigma green, ovary yellowish white, fr. shining green, torus l. yellowish brown; wood used for proa construction; nat. n.: *wároh*).

Distribution: Java, Borneo, Celebes, Talaud, Moluccas and Lesser Sunda Islands (Bali, Lombok, Soembawa).

Sonneratia caseolaris (L.) Engl. in Engl. & Prantl, Nat. Pflanzenfam. Nachtr. 1, 1897, 261.

Karakelong, Loc. 1, on coral reeves frequent, April 23: *n. 2504* (tree, 15 m; nat. n.: **peràpat'a*).

Distribution: E. Africa to Australia.

LECYTHIDACEAE

Barringtonia acuminata Korth., Ned. Kruidk. Arch. 1, 1848, 206.

Morotai, Loc. 12, old forest; *n. 3493* (small tree, 6 m, flow. bright red; nat. n.: *pangáha*).

Distribution: Borneo, Morotai, Ambon.

Barringtonia racemosa (L.) Bl. in DC., Prodr. 3, 1828, 288.

Karakelong, Loc. 1, frequent on riverbank, alt. 90 m, June 21: *n. 3349* (tree, 4 m, flow. greenish white, pedicels and fruiting calyx red; nat. n.: *párang'a*; bast and fr. contain a fishing dope) — Loc. 2, old forest on ridge, alt. 100 m, May 5: *n. 2844* (tree, 16.5 m, fr. green; nat. n.: *boeároh*; from bast fishing dope, used like the tuba dope, is made) — Salebaboe, Loc. 6, drier parts of swamp, alt. 5 m, frequent, May 28: *n. 3226* (tree, 6 m, flow. white or sometimes somewhat pink, with cocoa odour, fr. green; nat. n.: *párang'a*).

Distribution: India to Polynesia.

RHIZOPHORACEAE

Bruguiera conjugata (L.) Merr., Phil. Journ. Sci. Bot. 9, 1914, 118.

Karakelong, Loc. 1, in mangrove, very frequent, April 23: *n. 2503* (tree, 6 m, calyx pink without; nat. n.: *nanàsi *ésat'a*); April 28: *n. 2673* (tree, 7 m, corolla brown; nat. n.: *nanàsi *wawíne*).

Distribution: paleotropic.

Bruguiera cylindrica (L.) Bl., Enum. 1, 1828, 93.

Miangas, Loc. 9, in mangrove, many specimens together, June 12: *n. 3401* (tree, 4 m; nat. n.: *nanàsi*).

Distribution: India to Philippines and New Guinea.

Carallia brachiata (Lour.) Merr., Phil. Journ. Sci. Bot. 15, 1919, 249.

Morotai, Loc. 12, Goegoeti, G. Ligòjer, old forest on limestone, alt. 100 m, June 24: *n. 3587*.

Distribution: India to Australia.

Ceriops Roxburghiana Arn., Ann. Nat. Hist. 1, 1838, 363.

Karakelong, Loc. 1, in mangrove, very frequent, April 23: *n. 2502* (small tree, 5 m, flow. greenish yellow; nat. n.: *laríta*).

Distribution: India to Philippines and New Guinea.

Rhizophora mucronata Lam., Enc. Bot. 6, 1804, 189.

Karakelong, Loc. 1, in mangrove, frequent, April 28: *n. 2674* (tree, 9 m, flow. white; nat. n.: *nanàsi *ésat'a*).

Distribution: paleotropic.

COMBRETACEAE

Lumnitzera littorea (Jack) Voigt, Hort. Suburb. Calcutt., 1845, 39.

Miangas, Loc. 9, mangrove, alt. 1 m, frequent, June 12: *n. 3408* (small straight tree, ± 5 m high, branchlets greyish brown, lvs. coriaceous, rather d. green, shining, pedicels green, calyx dirty green, corolla bright red, filaments and style red, anthers and stigma dirty yellow, fr. shining green; nat. n.: *sawòwoh*).

Distribution: tropical Asia to Polynesia.

Terminalia Copelandii Elm., Leafl. Phil. Bot. 5, 1913, 1795.

Karakelong, Loc. 2, bank of K. Bahewa, sec. forest, alt. 20 m, May 16: *n. 3035* (tree, 24 m high, bole 11 m, diam. 0.75—0.60 m, trunk straight, cylindrical, bark brown, fissured, foliage just forming, young leaves dirty reddish brown, flow. entirely white, fetid, young infl. l. green; wood very much in demand for proa construction; nat. n.: *lanóéang'a*).

Distribution: Palawan, Talaud.

MYRTACEAE

Decaspermum ?Blancoi Vid., Phan. Cum. Phil., 1885, 112, 172.

Karakelong, Loc. 7, G. Piapi, very frequent on open slope, alt. 300 m, May 31: *n. 3273* (dense shrub, 1.5 m, flow. white to pink).

Distribution: Philippines, Talaud.

Eugenia ?acutangula K. Schum., Fl. Kais. Wilh. Land, 1889, 89.

Morotai, Loc. 12, on gravel bank along river, alt. 40 m, June 26: *n. 3616* (tree, 35 m, bark scaling off; nat. n.: *háleh* [Mor.] or *sáleh* [Ternate]; Marilako, riverbank, frequent: *n. 3638* (tree, 15 m; same nat. n.).

Distribution: Morotai, Ceram, New Guinea.

Eugenia ?calubcob C. B. Rob., Phil. Journ. Sci. Bot. 4, 1909, 364.

Salebaboe, Loc. 3, frequent in old forest, alt. 250 m, May 25: *n. 3165* (tree, 17 m, fr. edible; nat. n.: *mariwáoe*).

Distribution: Philippines, Talaud.

Eugenia claviflora Roxb., Fl. Ind., ed. 2, 2, 1832, 488.

Karakelong, Loc. 7, G. Piapi, open sunny slope, alt. 350 m, May 31: *n. 3271* (shrub, 2 m); alt. 480 m, June 2: *n. 3323* (shrub, 2 m, fr. pink).

Morotai, Loc. 12, old forest, alt. 330 m, June 25: *n. 3604* (tree, 4 m, fr. d. red; nat. n.: *máko-mákor*).

Distribution: India, Malay Peninsula, Philippines, Talaud, Morotai.

Eugenia cymosa Lam., Enc. Bot. 3, 1789, 199.

Karakelong, Loc. 7, G. Piapi, low forest, alt. 500 m, May 31: *n. 3255* (small tree, 3 m, fr. dirty violet; nat. n.: *sasáli'mbanáran'a*); open slope, alt. 400 m, May 31: *n. 3256* (tree, 7 m, fr. violet; nat. n.: *malóéntoh*).

Distribution: Mauritius, India, Malay Peninsula, Sumatra, Java, Talaud.

Eugenia ?Everettii C. B. Rob., Phil. Journ. Sci. Bot. 4, 1909, 371.

Kaboeroeang, Loc. 5, Pangangadoan'a grove, cleared old forest, alt. 200 m, May 27: *n. 3200* (tree, 13 m, flow. white; nat. n.: *taná'a*; wood in demand for house construction).

Distribution: Philippines, Talaud.

Eugenia ?fastigiata (Bl.) Koord., Med. 's Lands Plantent. 40, 1900, 104.

Karakelong, Loc. 1, cleared old forest, alt. 100 m, April 26: *n. 2607* (tree, 12 m, flow. yellowish green, fr. green when young, turning red and ultimately black; nat. n.: *barámbang'a*) — Loc. 7, G. Piapi, open forest, alt. 300 m, June 2: *n. 3313* (tree, 8 m; nat. n.: *raba'mpóéne*).

Distribution: Sumatra, Java, Talaud, Ambon.

Eugenia formosa Wall., Pl. As. Rar. 2, pt. 6, 1831, t. 108.

Morotai, Loc. 12, old forest, alt. 50 m, June 20: *n. 3464* (tree, 8 m; nat. n.: *tómi-tómi*).

Distribution: Malay Peninsula, Sumatra, Java, Borneo, Morotai.

Eugenia panduriformis Elm., Leafl. Phil. Bot. 4, 1912, 1412.

Karakelong, Loc. 1, partly cleared old forest, alt. 120 m, April 27: *n. 2664* (tree, 19.5 m high, bole 6.5 m, diam. 0.30—0.19 m, lvs. d. green with paler nerves above, paler below, calyx l. green, corolla greenish white in bud, filaments white, anthers l. greenish white, young fr. l. green; nat. n.: *aladóng'a*) — Loc. 7, G. Piapi, very frequent in old forest, alt. 100 m, June 3: *n. 3336* (tree, 12 m high, bole 9 m, diam. 0.20—0.15 m, trunk straight, cylindrical, pedicels green, calyx greenish white, corolla and filaments white, anthers l. brown, style greenish white, stigma l. green; nat. n.: *aladóng'a*).

Distribution: Mindanao, Talaud.

Eugenia saligna (Miq.) C. B. Rob., Phil. Journ. Sci. Bot. 4, 1909, 392.

Karakelong, Loc. 2, old forest on steep slope, alt. 70 m, May 5: *n. 2841* (tree, 28 m, flow. white; nat. n.: *aléwat'a*) — Nenoesa, Loc. 11, Garete, very frequent in cleared forest on limestone, alt. 5 m, June 14: *n. 3451* (tree, 13 m, flow. white; nat. n.: *maíle*).

Distribution: India to Philippines and Australia.

Myrtella Beccarii F. Muell., Descr. Pap. Pl., 1875, 106.

Karakelong, Loc. 7, G. Piapi, open sunny slope, very frequent, alt. 450 m, June 1: *n. 3286* (strongly branched shrub, 0.5—2 m high, branchlets l. grey, twigs brown or reddish, lvs. bright yellowish green or green, calyx yellowish green, corolla, stamens and gynaeceum creamy white).

Distribution: Talaud, New Guinea.

Osbornia octodonta F. Muell., Fragm. 3, 1862, 31.

Karakelong, Loc. 1, in *Sonneratia* forest on coral reef, alt. 0 m, April 28: *n. 2672* (small widely branched tree, 3 m high, bole 0.2 m, bark l. brown, scaling, lvs. coriaceous, bright green, petioles reddish brown; nat. n.: *taráoe'oe*).

Distribution: E. Java, N.E. Borneo, Celebes, Philippines, Talaud, Soembawa, S. New Guinea, N. Australia (cf. Van Steenis in De Trop. Nat. 25, 1936, 195 and Van Slooten in Blumea, Suppl. I, 1937, 171).

MELASTOMATACEAE (R. C. Bakhuizen van den Brink Jr.)

Astronia macrophylla Bl., Bijdr., 1825, 1080.

Karakelong, Loc. 2, old forest, alt. 60 m, April 30: *n. 2695* (small straight tree, ± 7 m high, bark greenish brown, lvs. rather d. green above, calyx brown in fr., young fr. brownish green; nat. n.: **tengtáramiseán*); Pasir Malap, old forest, alt. 50 m, May 13: very frequent, *n. 2979* (tree 8 m high, fr. coffee-brown; same nat. n. as n. 2695) — Loc. 7, G. Piapi, light forest, alt. 400 m; *n. 3320* (small tree, ± 5 m high, lvs. shining above, corolla red in bud).

Distribution: Sumatra, Java, Borneo, Celebes, Philippines, Talaud, Ambon.

Astronia ternatana Bakh. f., nov. spec.

Arbor mediocris, 19 m alta. *Rami* acute tetragoni, dense ferrugineo-lepidoti. *Folia* opposita oblonga, apice obtusiuscula, brevissime acuminata, basi acuta 5-nervia, nervi tertiarii transversi paulo conspicui haud reticulati, supra glabra nitida, subtus dense ferrugineo-lepidota, 8.5—14 cm longa, 3.5—6 cm lata, petioli 1.5—2.5 cm longi. *Inflorescentiae* terminales, 10 cm (vel ultra?) longae dense ferrugineo-lepidotae, pedunculis acute tetragonis canaliculatis, bracteis lanceolatis 0.3 × 0.1 cm, bracteolis 0.1—0.15 cm longis. Flores patentes mihi ignoti, alabastra obtuse ovoidea; pedicelli 0.1—0.15 cm longi; *calyx* campanulatus, basi subrotundato-quadrangularis, apicem versus attenuatus, sub apice perspicue constrictus, dense ferrugineo-lepidotus 0.25—0.3 cm longus, margine 5-lobatus, lobis crassis ovatis acutissimis 0.1—0.15 cm longis; *petala* 5 suborbicularia obtusa; *stamina* 10, antheris dolabriformibus minutis obtusis; *ovarium* calyce adnato, 3-loculare, apice excavatum, radiato-elevato-lineatum, stylo lepidoto 0.3—0.35 cm longo, stigmate capitellato subglobose lepidoto convexo 0.1 cm lato. *Baccae* ovoideae limbo 5-lobato praeditae, dense ferrugineo-vel rubiginoso-lepidotae, 0.35—0.4 cm longae, pedicellis 0.3—0.35 cm longis; *semina* linearia fere 0.3 cm longa.

Morotai, Loc. 12, Goegoeti, G. Ligòjer, alt. 60 m, old forest, April 24: *n. 3581* (tree, 19 m high, bole 8 m, straight, cylindrical, d. brown, diam. 0.35—0.25 m, lvs. d. green above, lower side with petioles and branchlets rich ferruginously pubescent; nat. n.: *gohora*) — Ternate, Lagoena, 450 m: *Beguin 692* (*typus fructus* L., dupl. Bz.) — Halmahera, Tobelo, 800 m: *Beguin 2311* (*typus floris*, L., dupl. Bz.).

Distribution: Morotai, Halmahera, Ternate; related species occur in N. Borneo, the Philippines and New Guinea.

Medinilla crassinervia Bl., Flora 14, 1831, 510.

Morotai, Loc. 12, G. Ligòjer, Goegoeti, old forest, alt. 100 m, June 24: *n. 3594* (climbing, ± 15 m high, branchlets l. brown, lvs. shining, d. green above, fr. l. yellowish green, peduncles green, pedicels yellowish red).

Distribution: ? Malay Peninsula, ? Borneo, Celebes, Moluccas (Morotai, Ternate, Boeroe, Ceram, Ambon, Banda), New Guinea.

Medinilla pterocaula Bl., Flora 14, 1831, 509.

Karakelong, Loc. 1, sec. forest, bank of rivulet, alt. 100 m, April 27: *n. 2666* (liana, several m long, stems brown, lvs. d. green above, l. green below, peduncles l. green, pedicels reddish violet, calyx l. green, corolla white, filaments and style yellowish green, anthers pink, white at base, stigma pink, young fr. l. green with violet margin) — Loc. 2, old forest, alt. 60 m, May 2: *n. 2755* (liana, lvs. bright green above, paler below, fr. dirty violet, pedicels reddish violet; nat. n.: *bindóé'a*); Pasir Malap, bank of K. Bahewa, alt. 20 m, May 14: *n. 3011* (liana, some m long, branchlets very pale grey, calyx pale yellow with red margin, corolla etc. as in n. 2666, ovary yellowish white, fr. and pedicels red; nat. n.: **dandíla*).

Distribution: Sumatra, Java, Talaud, New Guinea.

Medinilla Teysmanni Miq., Ann. Mus. Bot. Lugd.-Bat. 1, 1863—'64, 217.

Karakelong, Loc. 2, bank of K. Bahewa, alt. 30 m, May 3: *n. 2773* (shrub, branchlets greyish brown, lvs. dull d. green above, entire infrutescence and fr. snowy white, only the scars of the fallen bracts red).

Distribution: N. Celebes, Philippines, Talaud, Moluccas (Tidore, Boeroe, Ceram), ? New Guinea.

Melastoma polyanthum Bl., Flora 14, 1831, 480.

Karakelong, Loc. 1, sec. forest, sunny place, alt. 100 m, April 24: *n. 2551* (shrub, 1 m high, lvs. l. green, nerves reddish or brownish below, calyx brownish green, corolla l. violet) — Salebaboe, Loc. 3, G. Ajambana, skirt of forest, alt. 220 m, May 22: *n. 3100* (shrub, ± 2 m high, branchlets brownish grey, lvs. rather d. green above, calyx dirty pink, corolla violet, torus red, filaments l. yellow, the tips violet, anthers l. yellow, style violet, stigma l. green, ovary dirty pink; nat. n.: **tengtáramiseán èsaka*).

Distribution: India to Philippines and tropical Australia.

Memecylon costatum Miq., Anal. Bot. Ind. I, Verh. 1e kl. Ned. Inst. 2e reeks, 3, 1850, 29.

Karakelong, Loc. 2, old forest, alt. 200 m, May 9: *n. 2917* (tree?, 7 m high, branchlets brown, young fr. l. green with pink rim; nat. n.: *tatimbákas'a*; wood used for paddy pounders).

Distribution: Malay Peninsula to Philippines and Moluccas.

Memecylon protrusum Bakh. f., nov. spec.

Arbuscula, 4 m alta. Ramuli teretes glabri nitidi, nodis incrassati. *Folia*

opposita oblonga, breviter obtuse acuminata, basi rotundata, subcordato-amplexicaulia, subtrinervia glabra, supra nitida, subtus pallida, 25 cm longa, 11—13 cm lata, petioli latissimi usque ad 0.5 cm longi, costa media crassa, nervi tertiarii transversi, utrinque, praecipue subtus, perspicui haud reticulati. *Inflorescentiae* axillares, minutissimae, 1- vel maxime 3-florae, pedunculo tereti 0.2—0.3 cm longo. *Flores* ignoti. *Baccae* ellipsoideae, basi subacutae obliquae, apice limbo tetragono truncato coronatae, glabrae, venatae, 1.4—1.6 cm longae et diametro, pedicellis 0.2—0.3 cm longis, baccarum apices protrusae, calycis limbo excedentes vel aequales, obscure radiato-elevato-lineatae (discus epigynus).

Morotai, Loc. 12, Goegoeti, old forest, alt. 60 m, June 20: *n. 3470* (small straight tree, 4 m high, branchlets greyish brown, lvs. rigid, fairly d. green above, l. green below, fr. bright red; *type specimen*, L., dupl. Bz.).

Distribution: endemic. Its relation is with *M. costatum* Miq. (see above), *M. excelsum* Bl. (Sumatra, Java) and *M. gigantifolium* Elm. (Philippines; probably a form of *M. costatum*).

Osbeckia zeylanica L. f., Suppl., 1781, 215.

Nenoesa, Loc. 10, Merampi, G. Maranggi, alang-alang field, alt. 170 m, June 13: *n. 3435* (undershrub, stem reddish, lvs. green, l. green below, calyx l. green, corolla violet, tetramerous, filaments, style and stigma violet, anthers l. yellow, fr. reddish).

Distribution: India to Japan, Philippines, New Guinea and tropical Australia.

ONAGRACEAE

Jussieua angustifolia Lam., Enc. Bot. 3, 1789, 331.

Karakelong, Loc. 1, sec. forest, alt. 20 m, April 25: *n. 2574* (undershrub, 0.7 m high, lvs. l. green, petioles red at base, calyx l. green, slightly reddish, corolla yellow, ovary l. green, slightly reddish; nat. n.: **lá'a'mbábi*) — Salebaboe, Loc. 6, Lota swamp near Moronge, alt. 5 m, May 28: *n. 3217* (herb, lvs. bright green, stems often reddish, calyx green, margins slightly reddish).

Distribution: pantropic.

Jussieua linifolia Vahl, Eclog. Am. 2, 1798, 32.

Karakelong, Loc. 1, wayside, alt. 10 m, April 26: *n. 2629* (widely branched undershrub, 1.9 m high, lvs. and calyx green, fr. reddish).

Distribution: pantropic.

ARALIACEAE

Arthrophyllum diversifolium Bl., Bijdr., 1825, 879.

Karakelong, Loc. 1, cleared old forest, alt. 100 m, April 26: *n. 2616* (tree, 8 m, flow. greenish yellow; nat. n.: *langatòra*); alt. 120 m, April 27: *n. 2656* (tree, 15 m, fr. almost black; same nat. n. as n. 2616) — Loc. 2, Pasir Malap, frequent in old forest, alt. 60 m, May 13: *n. 2977* (tree, 12 m; same nat. n. as n. 2616) — Kaboeroeang, Loc. 4, Tonana forest reserve, very frequent in cleared old forest, alt. 75 m, May 26: *n. 3180* (tree, 11 m; nat. n.: *mángga *ahoerángan*).

Distribution: Malay Peninsula to Celebes, Talaud and New Guinea. Probably *A. Ahernianum* Merr. from Philippines is identical with this species.

Boerlageodendron barbatum (Becc.) Harms in Engl. & Prantl, Nat. Pflanzenfam. 3, pt. 8, 1894, 31.

Karakelong, Loc. 2, riverbank, alt. 50 m, May 1: *n. 2722* (tree, 6 m).

Distribution: Talaud, Banda, Kai.

Boerlageodendron serratifolium Elm., Leafl. Phil. Bot. 7, 1914, 2328.

Karakelong, Loc. 1, riverbank, alt. 20 m, April 23: *n. 2514* (small tree, lateral infl. yellow orange, fr. d. violet; nat. n.: *laripàtoe*); cleared old forest, alt. 40 m, April 25: *n. 2575* (small tree, 3 m, central fr. d. violet, lateral infl. orange-yellow). — Salebaboe, Loc. 3, cleared old forest, alt. 100 m, frequent, May 21: *n. 3078* (small tree, 1—6 m, young lateral infl. yellow, central ones l. green to d. red, fr. almost black; nat. n.: *laripàtoe*).

Distribution: Philippines (Leyte), Talaud.

Remark: The area of the genus is centred in New Guinea (16 species, Harms 1921) and the Philippines (22 species, Merrill 1923); some other species occur in Celebes and Borneo.

Polyscias nodosa (Bl.) Seem., Journ. Bot. 3, 1865, 181.

Morotai, Loc. 12, riverbank, alt. 40 m, June 22: *n. 3540* (tree, 13 m; nat. n.: *kòbo-kòbo*).

Distribution: Java, Celebes, Philippines, Moluccas.

Polyscias Rumphiana Harms in Engl. & Prantl, Nat. Pflanzenfam. 3, pt. 8, 1894, 45.

Karakelong, Loc. 2, N. Maraloem, beach, May 16: *n. 3040* (small tree, 2 m, infl. and flow. l. green; nat. n.: *limbawòtang*).

Distribution: Celebes, Talaud, Moluccas, Timor, New Guinea.

Schefflera ?confinis (Miq.) R. Vig., Ann. Sci. Nat. Sér. 9, 9, 1909, 355.

Karakelong, Loc. 2, steep riverbank, alt. 50 m, May 3: *n. 2786* (overhanging shrub, flow. buds l. greenish yellow; nat. n.: *ángkang'a*).

Distribution: Java, Celebes, Talaud, Halmahera.

Schefflera elliptica (Seem.) Harms in Engl. & Prantl, Nat. Pflanzenfam. 3, pt. 8, 1894, 36.

Miangas, in small grove on G. Kota, 90 m alt., June 11: *n. 3377* (liana, flow. yellowish greenish white; nat. n.: *anóéwoe*).

Distribution: Sumatra, Java, Borneo, Celebes, Philippines, Talaud, Ceram, New Guinea.

Schefflera ovoidea Merr., Phil. Journ. Sci. Bot. 3, 1908, 160.

Karakelong, Loc. 2, old forest, alt. 150 m, May 11: *n. 2943* (epiphytic).

Distribution: Mindanao, Talaud.

Tetraplasandra Koordersii Harms, Ann. Jard. bot. Buit. 19, 1904, 12.

Karakelong, Loc. 7, G. Piapi, open sunny slope, alt. 400 m, May 31: *n. 3262* (tree up to 8 m, infl. and fr. l. green; nat. n.: *langatòra*).

Distribution: Celebes, Talaud.

ERICACEAE

Iaera lanaensis (Merr.) Copel., Phil. Journ. Sci. Bot. 47, 1932, 83, t. 6, fig. 1—6.

Karakelong, Loc. 2, bank of K. Tatamboewe, old forest, alt. 60 m, May 8: *n. 2897* (epiphytic, branches l. brown, lvs. coriaceous, bright green,

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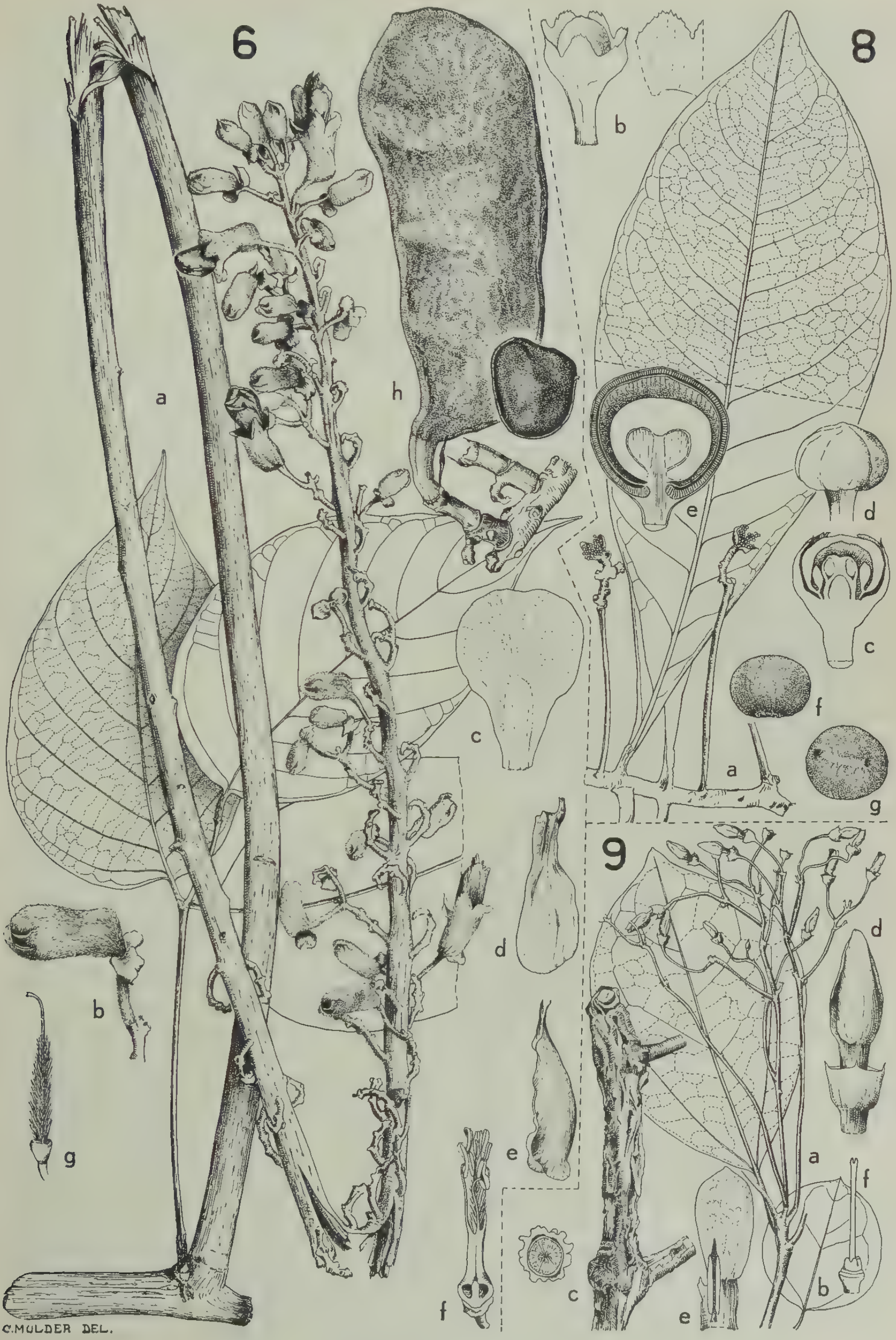
Fig. 6 — *Macropsychanthus dolichobotrys* Holth., n. sp. — a. flowering branchlet; b. flower bud; c. vexillum; d. ala; e. carina; f. staminal tube from above; g. carpel and style; h. pod and seed (a.—g. after *Lam n. 3002*, h. after *Lam n. 2893*).

Fig. 8 — *Discocalyx silvestris* Holth., n. sp. — a. branchlet with leaf and inflorescences; b. flower bud with part of calyx enlarged; c. flower bud, longitudinal section; d. corolla in bud, the calyx being removed; e. fruit, longitudinal section; f. seed, lateral view; g. ditto, top view (a.—g. after the *type specimen*).

Fig. 9 — *Jasminum suberosum* Holth., n. sp. — a. branchlet with young leaf and inflorescences; b. leaf; c. suberized branchlet with cross-section; d. flower bud; e. petal and stamen, inside; f. ovary and style (after the *type specimen*).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petioles almost white or brown, pedicels and calyx l. green, corolla white, anthers yellow, ovary l. green).

Distribution: Philippines (Panay, Negros, Mindanao), Talaud.

Vaccinium ?Vidalii Merr. & Rolfe, Phil. Journ. Sci. Bot. 3, 1908, 374.

Karakelong, Loc. 7, G. Piapi, open slope, alt. 400 m, May 31: *n. 3259* (terrestrial shrub up to 3 m, flow. bright red, fr. d. violet-red as is pedicel; nat. n.: *aloelá'a*); same alt. and date; *n. 3274* (widely branched shrub, flow. white or slightly pink; same nat. n. as n. 3259).

Distribution: Luzon, Talaud.

EPACRIDACEAE

Styphelia moluccana (Scheff.) J. J. Smith, Icon. Bogor. 4, 1910, 82.

Karakelong, Loc. 7, G. Piapi, open sunny slope, alt. 400 m, May 31: *n. 3280* (shrub, 1.5 m high, lvs. l. green, calyx greenish white, tip brown, corolla white or slightly brownish, style l. green, stigma red, ovary l. green; nat. n.: **tolenàsoe*).

Distribution: Talaud, Moluccas (Soela Islands, Gebeh, Boeroe, Ambon).

MYRSINACEAE

Aegiceras corniculatum (L.) Blco., Fl. Filip., 1837, 79.

Karakelong, Loc. 1, beach, alt. 1 m, April 23: *n. 2500* (lvs. coriaceous, pedicels and calyx l. greenish brown, corolla, filaments, style and stigma white, anthers l. brown).

Distribution: India to Australia.

Ardisia lanceolata Roxb., Fl. Ind. 2, 1824, 73.

Morotai, Loc. 12, G. Ligòjer, old forest, alt. 120 m, June 24: *n. 3593* (shrub, 0.5 m, fr. bright red, pedicel and calyx pink).

Distribution: Malay Peninsula to Celebes, Mindanao, Morotai and Ceram.

Discocalyx silvestris Holth., nov. spec. *Fig. 8* (p. 223).

Arbor parva glabra, erecta. Rami glabri, teretes, apice nonnullis ramentis acutis suffulti. *Folia* tenuiter chartacea, oblongo-lanceolata, supra medium latissima, 24—30 × 9—13 cm, apice obtuse acuminata, basi anguste cuneata e parte latissima gradatim angustata, integra. *Inflorescentiae* paniculatae, usque ad 20 cm longae, ex ramulis axillaribus vel extra-axillaribus efoliosis glabris apice interdum furcatis cicatricibus permultis rugosis ortae, bracteae acutae deciduae. *Calyx* 5-lobatus, lobi rotundati, apice minute crenulati. *Corolla* gamopetala, lobis 5 rotundatis (alabastra tantum videmus), *stamina* epipetalia sessilia, antheris truncatis longitudinaliter dehiscentibus. *Ovarium* columnare, stigmate sessili 5-angulato. *Fructus* drupacei, rubri, globosi, 0.8 cm alti, pericarpio tenui, endocarpio crustaceo; semen solitare depresso-globosum, albumine crasso.

A small straight *tree,* up to 5 m high. Branches dark chocolate-brown, terete, about 0.6 cm thick, glabrous, bud scales at the top thick, acutely lanceolate, up to 1 cm long, glabrous but covered with minute glands when young, and often minutely papillate when older. *Leaves* alternate, thin chartaceous, glabrous, shining, dark green above, pale green below, oblong to oblong-lanceolate, 24—30 cm long, 9—13 cm broad, apex broadly and bluntly acuminate, greatest width above the middle, from where the blade is gradually narrowing into the petiole, base narrowly cuneate, margins entire, midrib prominent below, secondary nerves 12—15, slender but conspicuous on either side, ascending at an angle of about 60°, curved towards the margin, archingly joined near the apex, tertiary nerves reticulate, often one or two between each pair of secondary ones stronger to almost as strong as the secondary nerves; petioles pale brown, 1.5 cm long, 0.3—0.4 cm thick, sulcate above. *Inflorescences* borne on specialized axillary or extra-axillary branches, which are glabrous, 4.5—20 cm long, 0.2—0.3 cm thick and entirely leafless, the inflorescences unbranched or sometimes forked, rugose with numerous scars, the tips bearing small panicles in the axils of bracts, which closely resemble the bud scales, but are somewhat smaller, panicles pink, 1—1.5 cm long, when in fruit up to 4 cm long, many-flowered, pedicels about 0.1 cm long. Flowers glabrous. Calyx in old buds about 0.1 cm long, with five blunt lobes, which are minutely crenulate at the top. *Corolla* globular in bud, gamopetalous, the 5 lobes rounded and with small resiniferous streaks or spots. *Stamens* 5, epipetalous, the anthers sessile, oblong-quadrangular, truncate or emarginate at apex, dehiscent over their full length. *Ovary* columnar, glabrous, the stigma sessile and 5-angular with minute slightly recurved teeth. *Fruit* a drupe, with persistent calyx, carmine, globose, 0.8 cm long, 0.7 cm in diameter, with faint longitudinal ribs, pericarp thin, endocarp crustaceous, shining within, the placenta surrounding the solitary seed like a balloon; seed depressedly globose with hard hyaline-white endosperm, 0.5 cm in diameter, with an apical groove, provided with small pits on either end, black when dry.

Karakelong, Loc. 2, old forest, alt. 200 m, May 8: *n. 2896* (tree, 4.5 m high, fruiting; nat. n.: *sóéwing'oe *oeróéne*); Pasir Malap, old forest, alt. 70 m, May 13: *n. 2975* (small tree, 1.5 m high, fruiting; nat. n.: *sóéwing'a*) — Salebaboe, Loc. 3, G. Ajambana, old forest, alt. 260 m, frequent, May 23: *n. 3132* (small tree, ± 3 m, with very young buds); alt. 250 m, May 25: *n. 3166* (tree, ± 5 m high, with old buds and ripe fr.; wood used for house construction; *type specimen*, L., dupl. Bz.).

Remarks: The genus is known from N. Borneo (1 species), the Philippines (37 sp.), New Guinea (4 sp.), Micronesia (4 sp.), Tonga and Fiji (4 sp.).

Embelia coriacea A. DC., Trans. Linn. Soc. Bot. 17, 1834, 135.

Morotai, Loc. 12, old forest, alt. 100 m, June 21: *n. 3509* (liana, ± 25 m long, lvs. dull d. green, slightly paler below, infl. l. greenish brown).

Distribution: Malay Peninsula, Sumatra, Java, Borneo, Mindanao, Basilan, Morotai.

Maesa tetrandra (Roxb.) A. DC. in DC. Prodr. 8, 1844, 82.

Karakelong, Loc. 1, sec. forest, April 24: *n. 2524* (small tree, 2.5 m high, branches brown, lvs. l. green, nerves brownish, calyx l. green, fr. fleshy, white when ripe; nat. n.: **tengtáramiseán*) — Salebaboe, Loc. 3, wayside, alt. 30 m, May 21: *n. 3092* (small tree, ± 3 m high, branchlets brown with paler lenticels, lvs. dull green, calyx greenish white, corolla white, fr. fleshy, translucent white when ripe).

Distribution: Java, Talaud, Moluccas, New Guinea.

Rapanea densiflora (Scheff.) Mez in Engl., Pflanzenr. 9, 1902, 365.

Karakelong, Loc. 7, G. Piapi, open sunny slope, alt. 300 m, May 31: *n. 3258* (shrub, ± 2.5 m high, branchlets grey, dwarf shoots brown, lvs. coriaceous, bright green, petioles greenish white, corolla greenish white with orange spots without) — Miangas, P. Baronto, on limestone, alt. 7 m, June 11: *n. 3373* (shrub, ± 2 m high, pedicels and calyx l. green; nat. n.: *pilíneh*) — Nenoesa, Loc. 10, Merampi, forest on limestone, alt. 100 m, June 13: *n. 3420* (tree, ± 10 m high, trunk straight, lvs. rather l. green, fr. and pedicels l. green; nat. n.: *piríneh*).

Distribution: Talaud, Salawati, Kai, New Guinea.

SAPOTACEAE (H. J. Lam)

Manilkara Merrilliana H. J. Lam, Blumea 4, 1941, 334.

Morotai, Loc. 12, Goegoeti, G. Ligòjer, old forest on limestone, alt. 100 m, locally frequent, June 24: *n. 3584* (lofty tree, 30 m high, trunk columnar, perfectly straight, bark fissured, very d. brown, bole 20 m, diam. 0.60—0.40 m, lvs. bright green, shining, milky juice white, abundant, thick and sticky; nat. n.: *ligòjer*).

Distribution: Philippines (Luzon, Samar, Mindanao), Central Celebes, Morotai.

Remarks: The specimen was formerly (Bull. Jard. bot. Buit., Sér. III, 7, 1925, 241 and 8, 1927, 481) erroneously quoted as *Northia fasciculata* (Warb.) H. J. Lam (*Mimusops fasciculata* Warb.). The locality G. Ligòjer is named after this species, one of the loftiest and finest trees in the forest. The tree may attain a height of 40 m; a girth of 5.65 m was actually measured. The wood is very hard.

Palaquium bataanense Merr., Bur. Gov. Lab. Bull. 17, 1904, 44; H. J. Lam, l.c., 1927, 395.

Nenoesa, Loc. 11, Garete, frequent in cleared forest on limestone, alt. 5 m, June 14: *n. 3446* (tree, ± 10 m high, diam. ± 0.3 m., lvs. shining d. green above, l. green below, midrib greenish white, calyx and pedicels l. green, latex fairly abundant, white; nat. n.: *anggirían*; wood used for proa construction).

Distribution: Philippines, Talaud, Central Celebes.

Palaquium Lobbianum Burck, Ann. Jard. bot. Buit. 5, 1886, 29; H. J. Lam, l.c. 1927, 398.

Morotai, Loc. 12, very frequent in old forest, alt. 60 m, June 21: *n. 3508* (young tree, ± 8 m high, bark white, branchlets brownish white, lvs. dull d. green above, ferruginously pubescent below; nat. n.: *tehíriki*); Goegoeti, G. Ligòjer, frequent in old forest on limestone, alt. 60 m, June 24: *n. 3579* (tree, 30 m high, bole 21 m, diam. 0.35—0.25 m, trunk straight, without buttresses, cylindrical, brownish green, latex not abundant, white, sticky, lvs. and nat. n. as in n. 3508).

Distribution: Morotai, Halmahera, Ternate.

Palaquium luzoniense (F. Vill.) Vid., Rev. Pl. Vasc. Fil., 1886, 176; H. J. Lam, l.c. 1927, 400.

Karakelong, Loc. 2, old forest, alt. 60 m, May 2: *n. 2736* (tree, 46 m high, bole 32 m, diam. 0.85—0.63 m, buttresses and stilt-roots up to 4 m high and 2.5 m spreading, latex abundant, watery, white, not sticky, lvs. d. green above, nerves lighter, lower side brown pubescent, ultimately glabrous and dull green, calyx and pedicel coffee-brown pubescent; nat. n.: *góémat'a*).

Distribution: Philippines, Talaud, Celebes.

Palaquium obtusifolium Burck, Ann. Jard. bot. Buit. 5, 1886, 33; H. J. Lam, l.c. 1927, 411.

Karakelong, Loc. 2, Pasir Malap, old forest on riverbank, alt. 20 m, May 14: *n. 3006* (tree, 35.8 m high, bole 27.8 m, diam. 0.32—0.21 m, trunk straight, cylindrical, bark brown, latex white, watery, copious, lvs. bright green above, l. green below, petioles brownish green; nat. n.: *nátoh*) — Nenoesa, Loc. 11, Garete, very frequent in cleared forest on limestone, alt. 3 m, June 14: *n. 3439* (tree, 16 m high, bole 14 m, diam. 0.30—0.20 m, trunk not straight, lvs. and nat. n. as in n. 3006) — Miangas, on limestone, alt. 5 m, frequent, June 11: *n. 3355* (tree with straight trunk, ± 10 m high, lvs. and nat. n. as in n. 3006, wood estimated for proa construction, reason why this species is also cultivated).

Distribution: Sumatra, Lesser Sunda Isl., Salajar, Boetoeng, Moluccas, Talaud.

Planchonella firma (Miq.) Dub., Ann. Mus. Col. Mars. 20, 1912, 59; H. J. Lam, l.c. 1927, 471.

Var. α **typica** H. J. Lam, l.c. 1925, 203.

Kaboeroeang, Loc. 5, Pangangadoan'a grove, cleared old forest, 200 m alt., *n. 3205* (tree, 13 m high, diam. 0.25 m, branchlets l. grey, lvs. shining d. green above, l. green below, fr. l. green, turning red).

Distribution of var. α: Malay Peninsula, Sumatra, Borneo, Celebes, Mindanao, Talaud, New Guinea.

Var. β **microcarpa** (Burck), H. J. Lam, Bull. Jard. bot. Buit., Sér. III, 7, 1925, 203.

Karakelong, Loc. 2, old forest, alt. 180 m, frequent, May 10: *n. 2923* (tree, 22.3 m high, bole 12.3 m, straight, diam. 0.35—0.34 m, bark brown, branchlets l. greyish brown, latex little, white, not sticky, buttresses small, 1.7 m high, 1 m spreading, young lvs. l. brown pubescent; nat. n.: *aléwat'a*); same locality and date, 200 m alt.: *n. 2924* (young tree, bark greenish white; nat. n.: *góémat'oe sángit'a*, i. e. góémat [= *Palaquium luzoniense*] from Sangihe) — Salebaboe, Loc. 3, G. Ajambana, old forest, alt. 260 m, frequent, May 22: *n. 3099* (tree, 18 m high, bole 14 m, straight, diam. 0.32—0.22 m, bark l. grey, buttresses 2 m high, 0.5 m spreading, lvs. shining d. green above, lighter below as are nerves; nat. n.; *bitáwak batoe*).

Morotai, Goegoeti, G. Ligòjer, old forest on limestone, alt. 100 m, frequent, June 24: *n. 3582* (tree, 25 m high, bole 16 m, straight and cylindrical, diam. 0.35—0.25 m, latex little, white, sticky, lvs. as in preceding nrs.; nat. n.: *otéomawále*).

Distribution of the variety: Flores, Celebes, Talaud, Morotai, Ambon, Saparoea, Kai; of the species: Malay Peninsula to Solomon Islands.

Planchonella nitida (Bl.) Dub., Ann. Mus. Col. Mars. 20, 1912, 62; H. J. Lam, l.c. 1925, 205 and 1927, 472.

Nenoesa, Loc. 10, Merampi, sec. forest near Dampoelis, alt. 20 m, June 13: *n. 3416* (very young tree, 2 m; nat. n.: *arambáhi*).

Distribution: Burma to Flores and New Guinea.

Planchonella obovata (R. Br.) H. J. Lam, l.c. 1925, 209 and 1927, 473.

Karakelong, Loc. 7, G. Piapi, frequent on open sunny slope, alt. 400 m, May 31: *n. 3272* (small tree, up to 5 m high, lvs. coriaceous, bright green above, lower side shining brown pubescent when young, more greyish and glabrescent when adult, latex white, fairly copious, branchlets greyish brown; nat. n.: *lolòtan*) — Nenoesa, Loc. 11, Garete, cleared forest on limestone, alt. 5 m, June 14: *n. 3447* (tree, 14 m high, bole 10 m, straight, diam. 0.20—0.13 m, further same annotations as n. 3272, flow. buds l. green, pedicels somewhat brownish; nat. n.: *laládon*).

Distribution: Seychelles to Polynesia.

Planchonella oxyedra (Miq.) Dub., Ann. Mus. Col. Mars. 20, 1912, 50; H. J. Lam, l.c. 1927, 474.

Karakelong, Loc. 7, G. Piapi, open forest, alt. 350 m, June 2: *n. 3311* (tree, 13 m high, bole 9 m, fairly straight and cylindrical, diam. 0.21—0.13 m, lvs. shining d. green on both sides; nat. n.: *nàki'mpasá'an*; wood used for house construction, but particularly for hatchet helves and for boar hunting spears).

Distribution: Malay Peninsula to Samoa.

Planchonella Vrieseana (Pierre) Dub., Ann. Mus. Col. Mars. 20, 1912, 59; H. J. Lam, l.c. 1927, 467.

Morotai, Loc. 12, Marilako, frequent in old forest on riverbank, alt. 20 m, June 29: *n. 3665* (tree, ± 15 m high, trunk fairly straight but with numerous small branches, latex white, not copious, branchlets d. brown, lvs. d. green above, with brown midrib, lighter below, nerves and pedicels brownish green, calyx l. brownish red, corolla with greenish yellow tube and dirty d. red lobes with greenish yellow tips and margins; nat. n.: *litòko*).

Distribution: N. Moluccas (Ceram, Morotai).

EBENACEAE (R. C. Bakhuizen van den Brink)

Diospyros hebecarpa Cunn. in Benth., Fl. Austr. 4, 1869, 286; Bakhuizen van den Brink, Bull. Jard. bot. Buit., Sér. III, 15, 1937, 221.

Salebaboe, Loc. 3, G. Ajambana, old forest, alt. 260 m, May 23: *n. 3130* (tree, 15 m high, bole 7 m, not straight, diam. 0.25—0.20 m, bark d. coloured, branchlets grey, lvs. bright green on both sides, fr. l. green with green calyx; nat. n.: **aloe'(m)ítoem'a* [Tal.] or *intámin* [Manado Malay]; wood used for construction purposes).

Distribution: Celebes, Philippines, Talaud, New Guinea, Australia, New Caledonia, ? Fiji.

Diospyros maritima Bl., Bijdr., 1825, 669; Bakhuizen van den Brink, l.c. 1937, 265.

Miangas, Loc. 9, G. Batoe, in small grove, alt. 90 m, June 11: *n. 3385* (small tree, ± 4 m high, lvs. d. green; nat. n.: *wawáni*).

Distribution: Sumatra to Solomon Islands.

Diospyros Rumphii Bakh., Gard. Bull. Str. Settl. 8, 1933, 184 and l.c. 1937, 156.

Kaboeroeang, Loc. 4, Tonana forest reserve, alt. 25 m, very frequent, May 26: *n. 3179* (young tree, 17 m high, bole 14 m, straight but furrowed, diam. 0.32—0.20 m, heartwood black, in this specimen still very slightly developed, lvs. d. green and shining above, lighter and dull below; nat. n.: *batoelíneh*; wood estimated).

Distribution: N. Celebes, Talaud, Halmahera.

OLEACEAE

Jasminum ?simplicifolium Forst. f., Prodr., 1786, 3.

Salebaboe, Loc. 3, skirt of sec. forest, alt. 50 m, May 21: *n. 3086* (twining, flow white).

Distribution: Java, Talaud, Boeroe, Australia, Polynesia.

Jasminum suberosum Holth., nov. spec., *Fig. 9* (p. 223).

Frutex scandens, glabra, rami novelli lenticellis suberosis conspicuis suffulti, vetustiores crasse suberosi. *Folia* opposita vel subopposita, simplicia, 5—17 × 12—15 cm, tenuiter coriacea, suborbicularia, apice breviter acute acuminata, basi truncata, 3—5-nervia, nervi 2 interiores saepe costa aequicrassi. *Paniculae* solitariae vel nonnullae e basi communi ortae, axillares, multiflorae, 12—24 cm longae, bracteis brevibus, acute triangularibus. *Calyx* urceolatus, 0.4 cm longus, margine 5 dentibus suffultus. *Corolla* alba, 1 cm longa, tubo brevi, petalis 5—6 oblongis, apice rotundatis, 0.7 cm longis, basi subhastatis. *Stamina* 0.7 cm longa. Ovarium glabrum, semiglobosum. *Fructus* ignoti.

A glabrous *liana*, climbing to a height of several meters. Branches with conspicuous suberized lenticels when young, the older ones with a thick papillate and furrowed corklayer, e. g. 0.3 cm thick in a branch of 1.2 cm diameter, the cork pale greyish brown. *Leaves* opposite or subopposite, simple, glabrous and shining on either surface, dark green above, pale green below, thin coriaceous, almost circular, 15—17 cm long, 12—15 cm broad, with a short acute acumen, a truncated or rounded base and entire margins, triplinerved or quintuplinerved, but then only the two inner nerves almost as strong as the midrib; petioles 2.5—4 cm long, 0.3 cm thick, curved. *Inflorescences* borne on axillary dwarf shoots, solitary or some together, 12—24 cm long, glabrous and many-flowered, bracts narrowly triangular, acute, about 0.2 cm long, pedicels 2—2.5 cm long, 0.1 cm thick. Flowers glabrous, 1.2 cm long; *calyx* cup-shaped, 0.4 cm long, 0.4—0.5 cm in diameter, with five subulate teeth of about 0.1 cm long; *corolla* white, tube 0.3 cm long, petals 5 or 6, oblong, rounded, 0.7 cm long and 0.4—0.5 cm broad, rounded at the tip, the base subhastate with two small lobes. *Stamens* 0.7 cm long and 0.2 cm broad, anthers acuminate at apex, slightly cordate at base, filaments very short. *Pistil* 0.6 cm long, ovary semiglobular, glabrous, style filiform, stigma with two short and blunt lobes. *Fruit* unknown.

Salebaboe, Loc. 3, G. Ajambana, old forest, alt. 300 m, May 23: *n. 3140* (with old buds; nat. n.: **a'ároembíran'a*; *type specimen*, L., dupl. in Bz.).

Very characteristic for this species are the suberose branches, the circular leaves and the long panicles. The species shows a very close affinity to *J. aphanodon* Miq. MS. from N. Celebes, but differs from it by the shorter calyx and the circular leaves; of *J. aphanodon* only scanty material was at our disposal, so that we could not state whether or not the older branches were suberized.

Linociera ramiflora (Roxb.) F.-Vill., Noviss. App., 1880, 128.

Karakelong, Loc. 2, old forest, alt. 200 m, May 9: *n. 2918* (tree, 6 m, flow. bright yellow).

Distribution: India to Australia.

Myxopyrum ovatum A. W. Hill, Kew Bull., 1910, 41, fig. 3.

Karakelong, Loc. 1, partly cleared old forest, alt. 100 m, April 26: *n. 2619* (liana, several m long, stems quadrangular, the older ones about cylindrical, l. brown, lvs. bright green, peduncles slightly violet, calyx l. green, corolla l. yellow, anthers very l. yellow, fr. green when young, yellowish orange with age; nat. n.: *_ápoet’oe aroembíran’a_).

Distribution: Talaud, Kai.

Remarks: The specimen agrees with Hill’s description but for the petals, which are up to 4.5 mm long; the leaves are up to 21 cm long. Hill’s specimen possessed no fruits. In the present specimen they are almost globose, narrowed towards the base, green when young, yellowish orange with age, black when dry, 1—1.4 cm in diameter, containing one or two globose seeds, which are black when dry and about 0.7 cm in diameter.

LOGANIACEAE

Couthovia celebica Koord., Meded. ’s Lands Plantent. 19, 1898, 537.

Karakelong, Loc. 2, Pasir Malap, frequent in forest on riverbank, alt. 20 m, May 13: *n. 2973* (tree, 27 m high, bole 16.2 m, diam. 0.50—0.35 m, bark l. brown, bast white, branchlets grey, spotted, lvs. d. green above, l. green below, nerves and petioles paler, calyx l. green, corolla greenish white, ovary l. green, infl. l. green, fr. green when young; wood used for house construction; nat. n.: *a’asíli*).

Distribution: Celebes, Philippines (Mindoro, Mindanao), Talaud.

Fagraea ?ternatana Miq., Ann. Mus. Bot. Lugd.-Bat. 2, 1865—1866, 217.

Karakelong, Loc. 7, G. Piapi, open slope, alt. 400 m, May 31: *n. 3264* (tree or large shrub, ± 3 m, flow. white, fragrant, fr. green, turning orange, seeds black; nat. n.: *tênggeh*).

Distribution: Ternate, Talaud.

Geniostoma celebicum Valet., Bull. Inst. Bot. Buitenzorg 12, 1902, 19.

Karakelong, Loc. 1, low sec. forest, alt. 90 m, April 25: *n. 2571* (small straight tree, 6 m high, bark l. greyish brown, fr. l. green; nat. n.: *abólo’a*) — Loc. 7, G. Piapi, open sunny slope, alt. 350 m, May 31: *n. 3268* (shrub, ± 3.5 m high, branchlets greyish brown to grey, lvs. dull green, fr. dull l. green) — Salebaboe, Loc. 3, G. Ajambana, old forest, alt. 260 m, May 23: *n. 3133* (small tree, ± 5 m high, lvs. bright green above, pedicels and buds l. green).

Distribution: Celebes, Talaud.

APOCYNACEAE

Alstonia scholaris (L.) R. Br., Mem. Wern. Soc. 1, 1809, 75.

Karakelong, Loc. 1, cleared old forest, alt. 40 m, April 25: *n. 2578* (tree, 20 m, latex white, abundant; nat. n.: *_pampoelóéta_ or *pamperóéda*).

Distribution: paleotropic.

Alyxia stellata (Forst. f.) Roem. & Schult., Syst. 4, 1819, 439.

Karakelong, Loc. 7, top of G. Piapi, very frequent in low forest, alt. 500 m, June 1: *n. 3289* (liana, several m long, branchlets grey, lvs. l. to rather d. green, fr. l. green when young, black when ripe).

Distribution: tropical Asia to Polynesia.

Cerbera manghas L., Sp. Pl., 1753, 208.

Karakelong, Loc. 1, sec. forest, alt. 10 m, April 23: *n. 2486* (tree, 10 m high, low branching, milky juice white, very sticky, lvs. bright green, paler below, calyx and peduncles l. green, sepals white, corolla white, tube l. green, slightly orange at throat, filaments yellow, anthers brown, style greenish white, stigma white, ovary l. green; nat. n.: *limbawóéta*).

Morotai, Loc. 12, frequent in old forest, alt. 50 m, June 20: *n. 3475* (tree, 15 m high, bole 10 m, straight, furrowed, diam. 0.14—0.10 m, milky juice white, watery, lvs. rather d. green above; nat. n.: *rédi*).

Distribution: tropical Asia to Polynesia.

Lepiniopsis ternatensis Valet., Ann. Jard. Bot. Buitenzorg 12, 1895, 252, t. 28.

Karakelong, Loc. 1, partly cleared old forest, alt. 100 m, April 26: *n. 2615* (small tree, 7 m high, bole 4 m, straight, branchlets glabrous, l. grey, milky juice watery, sticky when dry, lvs. d. green above, paler below, fr. bright red; nat. n.: *abá'a*) — Loc. 2, old forest, alt. 150 m, May 7: *n. 2882* (tree, 21 m high, bole 11.3 m, straight, cylindrical, diam. 0.23—0.21 m, bark greyish brown, peduncles green, older parts pale brown, corolla tube orange, tip of bud l. green, ovary l. green, fr. green; nat. n.: *samparoeái* or *tamparoeáoe*) — Salebaboe, Loc. 3, top of G. Ajambana, old forest, alt. 340 m, frequent, May 22: *n. 3101* (tree, ± 12 m high, trunk straight, cylindrical, d. brownish green, fr. yellow with age, fiery red when ripe; nat. n.: *tamparoeáoe*).

Morotai, Loc. 12, old forest, alt. 100 m, June 21: *n. 3516* (tree, 12 m high, bole 6 m, straight, diam. 0.20—0.16 m, bark brown, branches horizontally spreading, short, calyx l. green, corolla in bud with the tube salmon coloured and the lobes greenish white, fr. l. green; nat. n.: *poelosári*); same locality, alt. 200 m, frequent, June 23: *n. 3576* (tree, ± 10 m high, ± 0.15 m diam.; nat. n.: *poelohári*).

Distribution: Celebes, Philippines, Talaud, Moluccas.

Ochrosia oppositifolia (Lam.) K. Schum. in Engl. & Prantl, Nat. Pflanzenf. 4 pt. 2, 1895, 156.

Nenoesa, Loc. 11, Garete, cleared forest on limestone, alt. 3 m, very frequent, June 14: *n. 3440* (tree, 5 m high, bole 3 m, diam. 0.12—0.10 m, lvs. shining bright green above, dull. l. green below, midrib greenish white, petioles l. yellowish green, calyx and pedicels green, corolla white or l. greenish white, fr. green; nat. n.: *ampáwa*).

Distribution: Ceylon to Malay Archipelago and Micronesia.

Parsonsia Cumingiana A. DC. in DC., Prodr. 8, 1844, 402.

Karakelong, Loc. 1, sec. forest behind the beach, alt. 5 m, April 23: *n. 2489* (climbing, lvs. l. green, midrib and petioles slightly violet, calyx l. green, margin brown, corolla greenish white, filaments yellowish white, anthers l. brown); Loc. 8, near Dahang, in shrubs on the beach, alt. 0 m, June 4: *n. 3340* (climbing, some m long, branchlets greyish green, lvs. bright green, pedicels and calyx l. green, corolla yellowish green, disk creamy white, filaments l. yellow, anthers l. brown, style greenish white, ovary l. green; nat. n.: *mamíntak'a*).

Distribution: Java, Borneo, Philippines, Talaud, Moluccas.

Rauwolfia amsoniifolia A. DC., Prodr. 8, 1844, 338.

Karakelong, Loc. 7, G. Piapi, open slope, alt. 350 m, May 31: *n. 3265* (tree, 6 m, flow. greenish white, fr. yellow; nat. n.: *abá'a*); light forest, alt. 250 m, very frequent, June 2: *n. 3316* (small tree, 3 m, flow. and nat. n. as in nr. 3265).

Distribution: Celebes, Philippines, Talaud, Moluccas (Timor laoet, Kai, Tenimbar), New Guinea.

Rauwolfia javanica Koord. & Val., Booms. Java 1, 1894, 91.

Salebaboe, Loc. 3, old forest, alt. 300 m, May 23: *n. 3124* (tree, 16.5 m, flow. white; nat. n.: *ba'aròsa*; wood used for house construction).

Distribution: Java, N. Celebes, Talaud.

ASCLEPIADACEAE

Asclepias curassavica L., Sp. Pl., 1753, 215.

Salebaboe, Loc. 3, Liroeng, waste ground behind native premises, alt. 2 m, May 21: *n. 3095* (erect undershrub, lvs. bright green, paler below with greenish white midrib, pedicels and calyx l. green, corolla reddish orange, receptaculum bright yellow, column l. yellow).

Distribution: pantropic.

Dischidia Collyris Wall., Pl. As. Rar. 2, 1831, 36.

Morotai, Loc. 12a, near Wajaboela, in cultivated grounds, alt. 1 m, frequent, June 1: *n. 3684* (epiphytic, flow. white).

Distribution: Malay Peninsula, ? Sumatra, Java, Borneo, Celebes, Moluccas, New Guinea.

Dischidia ?Copelandii Schlecht., Phil. Journ. Sci. Bot. 1, Suppl., 1906, 298.

Karakelong, Loc. 1, sec. forest, alt. 80 m, April 24: *n. 2550* (epiphytic).

Distribution: Philippines, Talaud.

Dischidia hirsuta (Bl.) Decne. in DC., Prodr. 8, 1844, 632.

Karakelong, Loc. 2, old forest, alt. 60 m, May 2: *n. 2737* (epiphytic).

Distribution: Malay Peninsula, Sumatra, Java, Philippines, Talaud, Ceram.

Gymnema tingens (Roxb.) Spreng., Syst. 1, 1825, 844.

Miangas, Loc. 3, G. Kota, in grove, alt. 90 m, June 11: *n. 3391* (twining, some m long, milky juice white, lvs. bright green, slightly darker above, petioles and pedicels l. green, calyx green, corolla white, filaments dirty green, anthers dirty l. brown, ovary white, fr. green; nat. n.: *sesònoh*).

Distribution: S.E. Asia to Philippines and Moluccas.

Hoya sussuela (Roxb.) Merr., Interpr. Rumph. Herb. Amb., 1917, 438.

Karakelong, Loc. 1, cleared old forest, alt. 120 m, frequent, April 27: *n. 2659* (twining herb, flow. l. green without, shining d. violet red inside; nat. n.: *apobóéroe'a*) — Loc. 2, old forest, alt. 80 m, May 2: *n. 2784* (same annotations as n. 2659).

Distribution: Talaud, Ambon.

Tylophora Perrottetiana Decne. in DC., Prodr. 8, 1844, 609.

Karakelong, Loc. 1, forest skirt, alt. 100 m, April 26: *n. 2635* (twining, flow. and fr. l. green) — Kaboeroeang, Loc. 4, wayside in sec. forest, alt. 20 m, May 26: *n. 3197* (twining, flow. dirty l. brownish green, fr. green; nat. n.: *mariwoeàn'a*).

Distribution: Philippines, Talaud.

CONVOLVULACEAE (S. J. van Ooststroom)

Ipomoea aquatica Forssk., Fl. Aeg.-Arab., 1775, 44; Van Ooststroom, Blumea 3, 1940, 528.

Salebaboe, Loc. 6, Lota swamp, alt. 5 m, May 28: *n. 3219* procumbent herb, lvs. dull green, calyx and pedicels l. green, corolla, white with violet heart).

Distribution: pantropic.

Ipomoea congesta R. Br., Prodr., 1810, 485; Van Ooststroom, l.c. 500.

Salebaboe, Loc. 3, G. Ajambana, very frequent in sec. forest, alt. 150 m, May 20: *n. 3067* (twining, many m long, calyx green, greenish white with age, corolla almost white without, the inside and the margins violet; nat. n.: *apóékoeng'a*).

Distribution: pantropic.

Ipomoea digitata L., Syst. ed. 10, 1759, 924; Van Ooststroom, l.c. 558.

Nenoesa, Loc. 10, Merampi, in alang-alang field, alt. 100 m, June 13: *n. 3434* (twining, calyx and pedicels green or slightly violet, corolla l. lilac without, violet inside; nat. n.: *ondo*).

Distribution: pantropic.

Ipomoea gracilis R. Br., Prodr., 1810, 484; Van Ooststroom, l.c. 516.

Karakelong, Loc. 2, on gravel bank along K. Bahewa, alt. 15 m, May 15: *n. 3025* (procumbent herb, stems and petioles l. violet-brown, calyx and pedicels l. green, corolla l. lilac outside, the tube darker, violet inside; nat. n.: *bariwoeàn'a*).

Distribution: Madagascar to Polynesia, perhaps also in Mexico and the West Indies.

Ipomoea Pes-caprae (L.) Sweet, Hort. Suburb. Lond., 1818, 35; Van Ooststroom, l.c. 532.

Subspec. **brasiliensis** (L.) Van Ooststroom, l.c. 533.

Karakelong, Loc. 1, south of Beo, very frequent on the beach; April 23: *n. 2479* (procumbent, flow. lilac; nat. n.: *andaliaràn'a*).

Distribution (subspecies and species): pantropic.

Ipomoea tiliacea Choisy in DC., Prodr. 9, 1845, 375.

Karakelong, Loc. 1, sec. forest, alt. 80 m, April 24: *n. 2552* (twining, some m long, lvs. l. green, calyx l. green, corolla l. violet without, darker within; nat. n.: *bariwoeàn'a*).

Distribution: tropical America. Recorded by Hallier (Bull. Herb. Boiss. 7, 1899, 49) from W. Africa (Cameroons). The species was not yet recorded from tropical Asia. In hitherto unrecorded material from the Herbarium at Buitenzorg, we (Van Ooststroom) detected the following numbers from New Guinea, which undoubtedly also belong to this species:

North New Guinea, bank of a rivulet near Idenburg river, June 6, 1914, *Feuilletau de Bruyn n. 41*; Meervlakte, Mamberamo, November 20, 1914: *Feuilletau de Bruyn n. 214*; bank of Otken river, near Pionier bivouac, June 26, 1920: *H. J. Lam n. 413*; bank of Idenburg river, August 31, 1920: *H. J. Lam n. 989*; Meervlakte near Motor bivouac, Rouffaer river, 1926: *Docters van Leeuwen n. 11081* — without exact locality, 1926: *Docters van Leeuwen n. 11178*.

Lepistemon urceolatus (R. Br.) F. Muell., Census, 1892, 94.

Salebaboe, Loc. 3, G. Ajambana, sec. forest, alt. 200 m, May 20: *n. 3068* (twining, some m long, lvs. l. green, paler below, dirty violet-brown when young, pedicels and calyx l. green, corolla creamy white).

Distribution: Celebes, Talaud, Moluccas (Ceram, Boeroe), New Guinea, Solomon Islands, Australia.

Merremia peltata (L.) Merr., Interpret. Herb. Amb., 1917, 441; Van Ooststroom, Blumea 3, 1939, 352.

Karakelong, Loc. 1, cleared old forest, alt. 100 m, April 26: *n. 2622* (twining, several m long, lvs. green, nerves paler, calyx greenish yellow, corolla bright yellow, filaments, anthers and style very l. yellow, stigma white, ovary green; nat. n.: *boerá'an'a*); skirt of sec. forest, alt. 5 m, June 5: *n. 3352* (same annotations and nat. n. as n. 2622; stems used for temporary binding purposes) — Salebaboe, Loc. 3, G. Ajambana, sec. forest with alang-alang, alt. 220 m, May 23: *n. 3135* (same annotations and nat. n. as n. 2622, fr. greenish white).

Distribution: Madagascar, Mascarenes, Seychelles, Malay Peninsula to Polynesia.

Merremia tridentata (L.) Hall. f., Engl. Bot. Jahrb. 16, 1893, 552; Van Ooststroom, l.c. 1939, 315.

Subspec. **hastata** (Desr.) Van Ooststroom, l.c. 317.

Salebaboe, Loc. 3, south of Liroeng, in alang-alang field, alt. 50 m, May 21: *n. 3085* (twining, stem reddish, lvs. l. green, calyx l. green, reddish brown with age, corolla white, reddish violet within, stamens and style white, fr. d. brown) — Nenoesa, Loc. 10, Merampi, near Dampoelis, alang-alang field, alt. 40 m, June 13: *n. 3433* (twining, entire plant l. green, corolla white).

Distribution: East Africa to Australia.

BORAGINACEAE

Cordia Myxa L., Sp. Pl., 1753, 190.

Salebaboe, Loc. 3, sec. forest, alt. 60 m, May 20: *n. 3042* (young shoots on rim of culled trunk, ± 6 m high, trunk grey, lvs. bright green above, lower surface, petioles, pedicels and calyx l. green, corolla, stamens, style and stigma white; nat. n.: *nonáng'a*; of the seeds a sort of paper-glue is made).

Distribution: paleotropic.

Ehretia microphylla Lam., Tabl. Enc. 1, 1791—'97, 425.

Karakelong, Loc. 1, sec. forest, alt. 5 m, April 28: *n. 2676* (shrub, 2 m high, calyx green, corolla and style white, anthers d. brown; nat. n.: **landíla mèoh*) — Salebaboe, Loc. 3, G. Ajambana, sec. forest, alt. 100 m, May 20: *n. 3062* (shrub or small tree, 1—3 m high, branchlets d. brown, lvs. shining d. green above, slightly paler below, fr. fleshy, d. red; nat. n.: **randíla mèoh*) — Miangas, Loc. 9, G. Batoe, small grove, alt. 80 m, June 11: *n. 3363* (shrub, calyx dirty green, corolla white, fr. green; nat. n.: **dandíla*).

Distribution: India to Philippines, New Guinea and Solomon Islands.

Tournefortia argentea L. f., Suppl., 1781, 133.

Salebaboe, Loc. 6, near Moronge, beach, May 28: *n. 3227* (shrub, 1.5 m high, lvs. l. green, silvery shining pubescent on either side, calyx l. green, pubescent, corolla white, base greenish yellow, anthers brown with white margins, style greenish yellow, stigma brown, ovary l. green, fr. green) — Miangas, Loc. 9, beach, alt. 1 m, June 11: *n. 3369* (tree, ± 4.5 m high, same annotations as n. 3227, filaments greenish white, stigma dirty green; nat. n.: *wíndoe*).

Distribution: Mauritius to Polynesia.

Tournefortia sarmentosa Lam., Tabl. Enc. 1, 1797, 416.

Karakelong, Loc. 2, forest skirt on recent landslide, alt. 50 m, May 11: *n. 2956* (liana, some m long, lvs. l. green, paler below, branchlets brown, calyx l. green, corolla white, fr. l. green with black stigma; nat. n.: *landèrong'a*).

Morotai, Loc. 12, skirt of old forest, alt. 20 m, June 28: *n. 3641* (liana, ± 10 m long, corolla greenish white, fr. white).

Distribution: Mauritius to Australia.

VERBENACEAE (H. J. Lam and A. D. J. Meeuse)

(cf. Blumea 5, 1942, 66—80)

Avicennia marina (Forssk.) Vierh., Denkschr. Ak. Wiss. Wien 71, 1907, 435; Bakhuizen van den Brink, Bull. Jard. bot. Buit., Sér. III, 3, 1921, 203.

Var. ε **Rumphiana** (Hall. f.) Bakh., l.c. 213, t. 19.

Karakelong, Loc. 1, high mangrove forest, alt. 1 m, very frequent, April 28: *n. 2675* (tree, ± 15 m high, branchlets grey, twigs greyish green tomentose, lvs. dull green above, l. greenish yellow below, calyx l. green, corolla dirty orange, paler without, stamens brown, style d. violet, ovary l. green; nat. n.: *dalíta*).

Distribution of the variety: Malay Peninsula, Celebes, Philippines, Talaud, Moluccas, New Guinea; of the species: East Africa to Australia.

Callicarpa candicans (Burm. f.) Hochr., Candollea 5, 1934, 190 (= *C. cana* L.)

Miangas, Loc. 9, P. Baronto, on limestone, alt. 7 m, June 11: *n. 3372* (shrub, ± 1.5 m high, lvs. bright green above, white with l. brown nerves below, pedicels and calyx l. greenish brown, corolla l. violet, darker within, filaments and style l. violet, anthers l. yellow, stigma very l. violet).

Distribution: Mascarenes to Polynesia.

Callicarpa pedunculata R. Br., Prodr., 1810, 513.

Nenoesa, Loc. 10, Merampi, cultivated grounds, alt. 100 m, June 13: *n. 3429* (shrub, ± 1 m high, lvs. bright green above, l. green below, calyx l. green, corolla l. violet, filaments l. violet, anthers l. yellow).

Distribution: Malay Peninsula to Australia.

Clerodendrum Buchanani (Roxb.) Walp., Rep. Bot. Syst. 1844, 108 (= *Cl. Blumeanum* Schau.).

Karakelong, Loc. 1, sec. forest behind the beach, alt. 2 m, frequent, April 23: *n. 2485* (shrub, 2—3 m high, lvs. bright green, paler below, calyx, pedicels and corolla carmine, filaments and style pink, anthers dirty red, stigma yellow, fr. green when young, black with age; nat. n.: *pansaráng'a*) — Salebaboe, Loc. 3, Liroeng, cult. in nat. garden, May 21: *n. 3094* (shrub, 2 m, flow. red, fr. d. green) — Miangas, Loc. 9, beach, alt. 3 m, June 12: *n. 3414* (shrub, ± 1 m high, same annotations as in n. 2485, stigma d. red, style red; nat. n.: *andaliára*).

Distribution: Sumatra, Banka, Java, Borneo, Celebes, Talaud, Moluccas, New Guinea.

Clerodendrum inerme (L.) Gaertn., Fruct. Sem. 1, 1788, 271.

Karakelong, Loc. 1, beach, alt. 1 m, April 28: *n. 2683* (shrub, 2.5 m high, branches grey, lvs. rather d. green above, calyx l. green, corolla tube greenish white, lobes white, filaments white at base, violet at top, anthers brown, style and stigma violet, young fr. green; nat. n.: *sómbah*).

Distribution: Mascarenes to Polynesia.

Clerodendrum japonicum (Thunb.) Sweet, Hort. Brit., 1826, 322 (= *C. squamatum* Vahl).

Karakelong, Loc. 2, forest on bank of K. Tatamboewe, alt. 50 m, April 30: *n. 2699* (small straight tree, 3.5 m high, trunk 3 m, lvs. rather d. green, calyx greenish white without, bright red within, patent in fr., fr. green); alt. 40 m, May 3: *n. 2775* (same annotations as in n. 2699, calyx and pedicels d. red, corolla orange red, filaments l. red, style d. red).

Distribution: India and China to Japan, Philippines and Moluccas.

Clerodendrum Minahassae Teysm. & Binn., Nat. Tijdschr. Ned. Ind. 25, 1863, 409.

Salebaboe, Loc. 3, very frequent in sec. forest, alt. 50 m, May 20: *n. 3047* (small tree, branchlets very l. grey, lvs. dull d. green above, calyx green, corolla l. green when young; nat. n.: *soepángka asoewàn'a*).

Distribution: Celebes, Philippines, Talaud.

Faradaya splendida F. Muell., Fragm. 5, 1865, 21.

Karakelong, Loc. 8, north of Dahang, wayside, alt. 5 m, June 4: *n. 3342* (liana, ± 10 m long, lvs. bright shining green, fr. and calyx greenish white; nat. n.: *latára*).

Distribution: N. Borneo, Talaud, New Guinea, Queensland.

Geunsia pentandra (Roxb.) Merrill, Phil. Journ. Sci. Bot. 11, 1916, 309.

Karakelong, Loc. 1, sec. forest, alt. 100 m, very frequent, April 24: *n. 2523* (tree or shrub, 3—8 m high, bark l. grey, lvs. l. green, calyx l. green, corolla very l. violet, filaments l. violet, anthers violet, style and stigma l. violet, ovary l. green, young fr. shining green; nat. n.: *tananáloep'a*) — Loc. 2, old forest, alt. 250 m, May 7: *n. 2866* (tree, 19 m high, bole 9 m, diam. 0.30—0.21 m, further same annotations as n. 2523; nat. n.: *tananáloep'a*).

Distribution: Siam to New Guinea.

Premna corymbosa (Burm. f.) Rottl. & Willd., Ges. Nat. f. Freunde, Neue Schr. 4, 1803, 187 (= *P. integrifolia* L.).

Karakelong, Loc. 1, beach, alt. 0.50 m, frequent, April 23: *n. 2478* (large, widely branched shrub, 3 m high, lvs. l. green, infl. l. green, corolla greenish white with white hairs, filaments greenish white, anthers white; nat. n.: *sároh*); sec. forest, alt. 50 m, frequent, April 24: *n. 2534* (small tree or large shrub, corolla pale greenish yellow, young fr. l. green; nat. n.: *sároh*) — Miangas, Loc. 9, G. Batoe, open slope, alt. 60 m, frequent, June 11: *n. 3381* (shrub, ± 3 m high, lvs. bright green, calyx and filaments l. green, corolla l. green, lower lip slightly yellow, anthers d. brown; nat. n.: *sároh*).

Distribution: Madagascar to Polynesia.

Stachytarpheta indica (L.) Vahl, Enum. 1, 1804, 206.

Karakelong, Loc. 1, wayside, April 23: *n. 2494* (± prostrate undershrub, calyx l. green, corolla l. blue; nat. n.: *saibóé'a*).

Distribution: India to New Guinea.

LABIATAE

Ajuga bracteosa Benth. in Wall. Pl. As. Rar. 1, 1830, 59.

Salebaboe, Loc. 3, south of G. Ajambana, on ladang, alt. 200 m, May 24: *n. 3160* (herb, l. green, corolla white, filaments white, anthers brown, style greenish white, young fr. greenish yellow).

Distribution: Abyssinia, tropical Asia, Japan, Philippines, Celebes, Talaud, Ternate.

Hyptis capitata Jacq., Ic. Pl. Rar. 1, 1781—1786, t. 114.

Karakelong, Loc. 1, wayside, alt. 5 m, April 23: *n. 2496* (herb, stem d. violet at base, calyx l. green, corolla white; nat. n.: **áring kámbing*).

Distribution: a native of Mexico, introduced in Formosa, Micronesia, Philippines, Celebes, Talaud, Moluccas and Java.

SOLANACEAE

Physalis minima L., Sp. Pl., 1753, 183.

Karakelong, Loc. 2, gravel bank in K. Bahewa, alt. 25 m, May 16: *n. 3032* (herb, lvs. l. green, paler below, petioles and stem slightly reddish, calyx l. green; nat. n.: *daráteh*).

Distribution: pantropic.

Solanum nigrum L., Sp. Pl., 1753, 186.

Karakelong, Loc. 2, bank of K. Bahewa, alt. 40 m, May 4: *n. 2836* (herb, lvs. l. green, stem brownish green, calyx l. green, corolla white, anthers yellow, stigma green, young fr. green).

Distribution: cosmopolitic.

Solanum torvum Sw., Prodr., 1788, 47.

Karakelong, Loc. 2, bank of K. Bahewa, recent landslide, alt. 30 m, May 3: *n. 2772* (herb, lvs. d. green above, calyx green, corolla white, anthers yellow, style greenish white, stigma white, young fr. green; the fruits are eaten boiled; nat. n.: *sangkiróéman oe *wáwi*).

Distribution: pantropic.

SCROPHULARIACEAE

Ilysanthes antipoda (L.) Merr., Interpret. Herb. Amb., 1917, 467.

Karakelong, Loc. 1, sec. forest, alt. 10 m, April 25: *n. 2593* (herb, more or less prostrate, l. green, corolla tube white, lobes l. violet; nat. n.: *paláni wawíra*).

Lindernia crustacea (L.) F. Muell., Census, 1882, 97.

Salebaboe, Loc. 3, G. Ajambana, in *Caladium* plantation, alt. 150 m, May 20: *n. 3053* (herb, stems expanded, prostrate, lvs. and stems bright green, calyx l. green, corolla whitish pink, ripe fr. and fruiting calyx d. reddish green).

Distribution: paleotropic.

Scoparia dulcis L., Sp. Pl., 1753, 116.

Karakelong, Loc. 1, wayside, alt. 10 m, April 23: *n. 2482* (undershrub, more or less creeping, lvs. l. green, calyx l. green, corolla white, filaments white, anthers and stigma l. green, style l. violet, fr. green when young, brown with age; nat. n.: _*ambóéranga’mbábi_).

Distribution: pantropic.

BIGNONIACEAE

Dolichandrone spathacea (L. f.) K. Schum., Fl. Kais. Wilh. Land, 1889, 123; Van Steenis, Bull. Jard. bot. Buit. Sér. III, 10, 1928, 227.

Salebaboe, Loc. 6, drier parts of Lota swamp near Moronge, alt. 5 m, frequent, May 28: *n. 3225* (small tree with short and heavy trunk and ascending branches, 6 m high, diam. 1.43 m, flow. white with a strong hyacinth-odour, corolla tube yellowish green, fr. d. green, turning brown when drying; nat. n.: *ansarángi*).

Distribution: India to Philippines and New Guinea.

GESNERIACEAE

Cyrtandra ?capitellata Clarke in DC., Mon. Phan. 5, 1883—1887, 259.

Karakelong, Loc. 2, old forest, very frequent, alt. 100 m, April 30: *n. 2697* (undershrub, 2.2 m, flow. dirty yellowish white).

Distribution: Talaud, Ternate.

Cyrtandra coccinea Bl., Bijdr., 1825, 772.

Karakelong, Loc. 2, riverbank, alt. 50 m, May 2: *n. 2744* (herb or undershrub, up to 3 m, flow. red, protandrous, young fr. l. green).

Distribution: Java, Celebes, Talaud, Ceram, Timor.

Cyrtandra ?pallida Elm., Leafl. Phil. Bot. 2, 1908, 559.

Morotai, Loc. 12, old forest, alt. 50 m, June 20: *n. 3476* (shrub, 1 m, lvs. d. violet below, flow. white, fr. dirty violet).

Distribution: Philippines (Negros, Mindanao), Morotai.

Trichosporum radicans (Jack) Nees, Trans. Linn. Soc. 14, 1823, 43.

Karakelong, Loc. 2, old forest, riverbank, alt. 50 m, May 2: *n. 2741* (epiphytic, flow. carmine).

Distribution: Malay Peninsula, Sumatra, Java, Borneo, Celebes, Talaud.

ACANTHACEAE (C. E. B. Bremekamp)

Acanthus ilicifolius L., Sp. Pl., 1753, 639.

Karakelong, Loc. 1, landside of mangrove, frequent, April 23: *n. 2475* (shrub, 2 m high, lvs. bright green, paler below, calyx l. green, corolla and filaments white, fr. green; nat. n.: _lalónda *ésat’a_; specimens with spineless leaves are called _lalónda *wawíne_).

Distribution: paleotropic.

Remarks: Probably *A. ebracteatus* Vahl is a variety of the present species.

Graptophyllum pictum (L.) Griff., Notul. 4, 1854, 139.

Karakelong, Loc. 8, north of Dahang, wayside, alt. 5 m, June 4: *n. 3341* (shrub, ± 1.5 m high, lvs. l. green, calyx green, corolla d. violet, the smaller anthers l. violet, the larger ones dirty violet brown as is stigma, ovary l. green; leaves mixed with a poultice of rice are used against framboesia; nat. n.: *pampára rawíran'a*).

Distribution: possibly a native of New Guinea (the genus is Australian-Polynesian), now pantropic.

Hemigraphis alternata (Burm.) T. And., Journ. Linn. Soc. 7, 114, 1864 syn. excl. — *Ruellia alternata* Burm., Fl. Ind., 1768, 135 — *Ruellia colorata* Bl., Bijdr., 1826, 795 — *Hemigraphis colorata* (Bl.) Hallier f., Abh. Kais. Leop.-Car. Akad. Naturf. 70, 1897, 199, t. IX, fig. 1 and 2 — (non *H. alternata* [Burm.] T. And. apud Clarke in King et Gamble, Mat. Fl. Mal. Pen. in Journ. As. Soc. Beng. 74, 2, 1907, 653, nec apud auctores alios qui postea de plantis asiaticis tractaverunt, nam species eorum est *H. Blumeana* [N. ab E.] T. And.).

Kaboeroeang, Loc. 5, cleared old forest, alt. 60 m, May 27: *n. 3215* (herb, prostrate, stems rooting, petioles and stems dirty reddish violet, lvs. dirty green above, d. reddish violet below, nerves darker, calyx and bracts d. violet, corolla white).

Distribution: possibly originally from eastern Malaysia; now cultivated in many tropical countries.

Remarks: Anderson l. c. identified *Ruellia alternata* Burm. with *R. Blumeana* N. ab E., but as Burman described the leaves of his plant as "oblongo-cordatis", whereas in *R. Blumeana* they are lanceolate, it appeared to me that this could not be right. I (Bremekamp) therefore asked Prof. Hochreutiner to compare for me Burman's type with that of the other species, which are both in the Herbarium DeCandolleanum. Prof. Hochreutiner replied that he had studied this problem already some years ago, and kindly sent me an unpublished paper in which he had laid down the results of his investigation. The latter are summarized in the synonymy given above. I wish to express here my thanks to Prof. Hochreutiner for his permission to make use of his notes.

Burman obtained his material of this species from Java, and quoted synonyms from Rumphius and Van Rheede, but Van Rheede's plant is doubtless a *Scrophulariacea*, and among Rumphius's *Hemigraphis* species (*Prunella domestica* and *P. silvestris*) not one fits the description of *H. alternata*. This species is now everywhere in tropical countries grown as a garden plant, but as it is apparently everywhere sterile, its origin remains uncertain. In Java it is, as Blume already pointed out, never found in the jungle, and this doubtless applies also to most of the other parts of the country in which up to now it has been collected. Where it has been found some distance from the next dwelling, it grew perhaps always on the site of a former settlement. As it belongs to the same group as the other species enumerated in this paper, and resembles in several respects *H. Rumphii*, it may have come from the eastern part of the Malay Archipelago.

Hemigraphis ceramensis Brem., nov. spec. (typus: *Kornassi 60*).

Herba e basi repente ascendens. *Caulis ramique* primum pilis retrorsis

dense hispidi, deinde plus minusve glabrescentes, internodiis bisulcatis et subcostatis. *Folia* petiolo 5—15 mm longo, pilis suberectis primum dense hispido munita; lamina lanceolata 3—5 cm longa et 0.6—1.2 cm lata, subacuta vel subcontracta, margine integra, supra praesertim costa setulis paucis, mox deciduis sparsa, subtus costa nervisque ut margine setulis parvis scabridula, cystolithis utrimque sed praesertim supra conspicuis, nervis utroque latere costae plerumque 5. *Spicae* solitariae, plerumque mox a ramulis uno vel duobus ex axillis foliorum supremorum orientibus superatae; pedunculus gracillimus 3—6 cm longus, subglaber; rhachis ultimo usque ad 4.5 cm longa; bracteae 4- vel 5-parae, lineari-oblanceolatae, infimae usque ad 2 cm longae, aliae 1 cm longae et 2 mm latae, subobtusae, margine et facie inferiore costae setulis aliquibus parvis ciliolatae, ceterum glabrae, persistentes; flores in axillis bractearum plerumque solitarii, ebracteolati. *Calyx* 8 mm longus, 5-carinatus, lobis angustissime triangularibus margine ciliolatis, ceterum subglabris. *Corolla* 13 mm longa, extus faucibus lobisque puberulo-pubescens, tubo 4.5 mm, faucibus 5 mm, lobis ovatis 3.5 mm longis. *Stamina* filamentis glabris. Granula pollinis breviter ellipsoidea 32 longa et 26 μ diam., virgis minutis granulatis 21 munita. *Ovarium* apice comatum, quoque loculo ovulis 5; stylus hirtellus. *Capsula* 10-seminalis. *Semina* brunnea, parvo-areolata.

Karakelong, Loc. 2, old forest on riverbank, alt. 50 m, May 1: *n. 2712* (herb, lvs. dull green, l. green below, calyx very l. green, corolla, filaments, anthers, style and stigma white).

Ceram, in the north at Wai Toehoe, alt. 80 m: *Kornassi* (Exped. *Rutten*) *60* (U., *typus*; L., dupl. typi); in the south-east at Kotta, alt. 100—200 m: *id. 1014* (U.).

Distribution: Ceram, Talaud.

Remarks: Like all the other *Hemigraphis* species collected in Talaud, this plant belongs to a group which finds its main distribution in the Philippine Islands, the Moluccas and New Guinea. Outside this area it is represented in Celebes by two species and in Borneo by one. The group is characterized by the absence of bracteoles and by very small, shortly ellipsoidal pollen grains provided with 21 or more nearly smooth or minutely granulated bands. The species with the widest distribution in this group is *H. primulifolia* (N. ab E.) F. Vill., which occurs in the whole of Celebes and everywhere in the Philippine Islands and in the Moluccas, but is not yet with certainty known from New Guinea.

Hemigraphis lanceolata Merrill, Phil. Journ. Sc. 20, 1922, 452.

Salebaboe, Loc. 3, G. Ajambana, sec. forest, alt. 100 m, May 20: *n. 3059* (herb, stems, bracts and calyx reddish, lvs. bright green above, midrib reddish, d. reddish violet below, corolla dirty pink).

Distribution: N. Celebes, Philippines, Talaud.

Remark: This species comes very near to *H. stenophylla* Hallier f. from Celebes and Morotai, *H. angustifolia* Hallier f. from Ambon and Ternate and *H. novoguineënsis* Brem. inedit. from New Guinea.

Hemigraphis Rumphii Brem., nov. spec. (typus: *Teysmann s. n.* [Wai], L.) — prob. *Prunella silvestris rubra* Rumphius, Herb. Ambon. Lib. X, p. 32, Tab. XIII, fig. 3 — *Hemigraphis prostrata* Hallier f., Abh. Kais.

Leop.-Car. Akad. Naturf. 70, 1897, 202, nom. conf. quoad specimina moluccana infra citata.

Herba ascendens vel suberecta. *Caulis ramique* primum breviter et sparse pubescentes, deinde glabrescentes, primum bi- vel quadrisulcati. *Folia* petiolo gracili 1—4 cm longo, sparse et breviter pubescente munita; lamina ovata 4—12 cm longa et 2.2—5.5 cm lata, obtusa, basi ad petiolum subito contracta, margine irregulariter grande repando-dentata et incurvata, subcoriacea, supra saturate viridis, subtus rubro-violacea, supra primum sparse scabridula, mox glabrescens tamen, nitidula, subtus costa nervisque sparse et breviter pubescens, ceterum glabra, cystolithis utrimque numerosis, sed supra majoribus et magis conspicuis, nervis utroque latere costae 5—6. *Spicae* plerumque in triades dispositae, densae et multiflorae; pedunculus gracilis 1—2 cm longus, pilis brevibus cum aliquibus longioribus mixtis vestitus; rhachis subglabra; bracteae ovatae vel ovato-lanceolatae 10—15 mm longae et 4—8 mm latae, subobtusae, margine et interdum costa pilis longis fugacibus ciliatae, ceterum glabrae, persistentes, infimae plerumque flores tres, medianae flores duos superpositos, superiores flores suffulgentes; flores ebracteolati. *Calyx* 9 mm longus, fructu accrescens, 5-carinatus, lobis anguste triangularibus acutis, costa et margine pilis brevibus cum aliquibus longioribus mixtis ciliatis, ceterum glabris. *Corolla* alba 21 mm longa, tubo 8 mm, faucibus 9 mm, lobis rotundatis, extus breviter pubescentibus 4 mm longis. *Stamina* filamentis glabris, longioribus 3 mm, brevioribus 1.2 mm longis; antherae 1.5 mm longae thecis basi muticis. Staminodium minimum. Granula pollinis breviter ellipsoidea 40 μ longa et 28 μ diam., virgis minute granulatis 21 munita. *Ovarium* dimidio superiore pubescens, apice comatum, quoque loculo ovulis 6; stylus hirtellus. *Capsula* subglabra, seminibus 10—12. *Semina* brunnea, parvo-areolata, extra areolam pilis annulatis brevibus vestita.

Ambon, Wai: *Teysmann s. n.* (L., *typus*) — Saparoea, *Teysmann 5024* (U.) — Ceram, Kaibobo: *Forsten s. n.* (L.); *De Vriese & Teysmann s. n.* (L.) — Tidore, B. Mala-mala, alt. 850 m: *Lam 3752* (Bz.) — Ternate: *Forsten s. n.* (L.).

Var. **angustifolia** Brem., nov. var. (typus: *Kornassi 132*).

Cauli repente, foliis lineari-lanceolatis, 5.5—6 cm longis et 1.2—1.5 cm latis, basi acutis, margine undulatis, supra opacis, bracteis angustioribus a typo recedens.

Karakelong, Loc. 1, sec. forest, bank of rivulet, alt. 100 m, April 27: *n. 2669* (herb, stem more or less prostrate, lvs. green above, l. green below, old lvs. reddish, calyx l. yellowish green, corolla white).

Ceram, Kaloa, alt. 80 m: *Kornassi* (Exped. *Rutten*) *132* (L., *typus*).

Distribution of the variety: Ceram, Talaud.

Var. **gracilis** Brem., nov. var. (typus: *Kornassi 1132*, L.) — *H. reptans* (Forst.) Engl. ex K. Sch. var. *glaucescens* Hallier f. in errore apud Merrill, Interpr. Herb. Amb. et Robinson in schedula "Plantae Rumphianae Amboinenses n. 100".

Foliis ovato-oblongis, vix repandis, minoribus, floribus in axillis bractearum fere semper solitariis, granulis pollinis minoribus a typo recedens.

Saleбaboe, Loc. 3, G. Ajambana, sec. forest, alt. 100 m, May 20:

n. 3058 (herb, lvs. d. green above, very l. green below, calyx l. green, corolla white, stem and bracts green, slightly reddish).

Ambon, Wai Batoe Gantoeng: *Kornassi* (Exped. *Rutten*) *1132* (L., *typus*; U., dupl. typi); Ema: *Teysmann s. n.* (L.); sine loc.: *Robinson*, Plantae Rumphianae Amboinenses 100 (L.) — Ceram, Hatoemeten, alt. 0 m: *Kornassi* (Exped. *Rutten*) *817* (L., U.) — Boano (near Ceram), alt. 0—200 m: *id. 1294* (U.).

Distribution of the variety: Talaud, Ceram, Ambon.

Remarks: The pollen grains of this variety measure but 33 μ × 25 μ; the seeds are provided with a larger areola and somewhat longer hairs than those of the main form. It is not impossible that further study, for which more complete material will be required, will show that it should be raised to specific rank. This applies also to the preceding variety.

Var. **pubescens** Brem., nov. var. (typus: *Lam 3560*).

Caulibus petiolisque primum densissime, deinde satis dense pubescentibus, foliis supra setulis persistentibus sparse, subtus costa nervisque dense, inter nervos minus dense pubescentibus, bracteis et calyce extus densius pubescentibus a typo recedens.

Morotai, Loc. 12, old forest, alt. 130 m, June 22: *n. 3560* (herb, lvs. dull d. green above, l. green below, calyx l. green, slightly reddish, corolla white, slightly reddish within, stamens, style and stigma white; *typus*, L., dupl. Bz.).

Distribution of the variety: Morotai, of the species: Talaud, Moluccas.

Remark: The leaves of the form accepted above as the type of the species are purple below.

Hemigraphis stenophylla Hall. f., Nov. Act. Acad. Nat. Cur. 70, 1897, 203.

Morotai, Loc. 12, Goegoeti, many specimens together on riverbank, alt. 40 m, June 26: *n. 3623* (lvs. d. green above, l. green below, calyx l. green, tube of corolla white, l. brown above, lobes l. violet, young fr. l. green).

Distribution: N. Celebes, Morotai.

Hemigraphis undulata Brem., nov. spec. (typus: *Lam 3398*).

Herba repens. *Caulis ramique* graciles, vix 1.5 mm diam., subteretes, leviter bisulcati, primum densius, deinde sparse pubescentes, internodiis usque ad 5 cm longis; rami floriferi ascendentes. *Folia* petiolo 4—20 mm longo, densius et longe pubescente munita; lamina foliorum majorum ovata, foliorum minorum apice ramorum congestorum ovato-orbicularis, 10—28 mm longa et 8—17 mm lata, obtusa, basi rotundata vel subcordata, margine crenata et conspicue undulata, supra setulis basi incrassatis scabridula, subtus costa nervisque densius, inter nervos sparse pubescens, cystolithis vix conspicuis, vivo utrimque laete viridis, nervis subtus tamen subviolaceis, nervis utroque latere costa 4—5. *Spicae* 1—1.5 cm longae; pedunculus 3 mm longus; bracteae infimae foliaceae, ellipticae, circ. 8 mm longae, basi acutae, nervis utroque latere costae 3 munitae, aliae lineari-oblanceolatae, 6—8 mm longae et 2 mm latae, margine longe sed appresse ciliatae, supra pilis similioribus sparse, subtus costa breviter pubescentes; flores in axillis bractearum solitarii, ebracteolati. *Calyx* viridis 8 mm longus, 5-carinatus, lobis anguste triangularibus ciliatis. *Corolla* alba 10 mm longa, extus faucibus lobisque puberula, tubo 4 mm longo, faucibus tubo aequilongis, lobis rotundatis 2 mm longis. *Stamina* filamentis glabris, exterioribus 1.8 mm longis, interioribus 0.7 mm longis; antherae 1.4 mm longae, thecis basi muticis. Granula pollinis breviter ellipsoidea 39 μ longa et 29 μ diam., virgis minute granulatis 21 munita. *Ovarium* 1.7 mm altum, apice comatum, quoque loculo ovulis 4—5; stylus sparse hirtellus. *Capsula* nondum nota.

Miangas, Loc. 9, G. Soro, open grass-slope, alt. 60 m, June 11: *n. 3398* (creeping herb, lvs. l. green, nerves slightly violet below, calyx l. green, corolla white; nat. n.: *arompéna*; *typus*, L., dupl. Bz.).

Distribution: endemic, but related to the wider spread *H. primulifolia* (N. ab E.) F. Vill.

Hygrophila salicifolia (Vahl) Nees in Wall., Pl. As. Rar. 3, 1832, 81.

Karakelong, Loc. 1, swampy grounds, alt. 20 m, April 25: *n. 2597* (lvs. l. green, stems paler, calyx greenish white, corolla white; nat. n.: *saewóé'a óétan*) — Salebaboe, Loc. 6, Lota swamp near Moronge, alt. 5 m, May 28: *n. 3218* (herb, lvs. dull green, paler below, midrib paler, calyx tube l. green, lobes d. green, corolla white, lip l. greenish yellow with l. violet tip, filaments and connective white, anthers violet, style and stigma white, fr. green).

Distribution: India and China to Philippines, New Guinea and Australia. The distribution of the species is not perfectly certain; some forms now included in the species perhaps have to be considered distinct species.

Lepidagathis Robinsonii Merr., Phil. Journ. Sci. Bot. 11, 1916, 314.

Salebaboe, Loc. 3, very frequent in sec. forest, alt. 100 m, May 20: *n. 3049* (herb, 20—100 cm high, lvs. shining d. green above, paler below, petioles and stems often violet reddish brown, bracts green, slightly reddish, calyx l. green, corolla white).

Distribution: Talaud, Ambon.

Peristrophe bivalvis (L.) Merr., Interpret. Herb. Amb., 1917, 476.

Karakelong, Loc. 1, sec. forest, alt. 5 m, April 28: *n. 2678* (undershrub, lvs. bright green, bracts green, calyx almost white, corolla, filaments and style white, anthers very l. brown) — Salebaboe, Loc. 3, G. Ajambana, sec. forest, alt. 100 m, May 20: *n. 3055* (herb, entire plant d. green, calyx greenish white, corolla, stamens and pistil white).

Distribution: India and China to Malaysia, often cultivated.

RUBIACEAE (C. E. B. Bremekamp)

Anthocephalus macrophyllus (Roxb.) Havil., Journ. Linn. Soc. Bot. 33, 1897, 23.

Karakelong, Loc. 2, bank of K. Bahewa, alt. 30 m, very frequent, May 15: *n. 3030* (straight tree, ± 15 m high, trunk cylindrical, brown, branchlets brown, lvs. d. green above, l. green below, nerves still paler, peduncle green, infl. creamy white, fragrant; wood used for house and proa construction; nat. n.: *awá'a*).

Distribution: Talaud, Ambon.

Antirrhoea microphylla (Bartl.) Merr., Enum. Phil. Fl. Pl. 3, 1923, 540.

Karakelong, Loc. 7, G. Piapi, open sunny slope, alt. 350 m, frequent, May 31: *n. 3260* (tree, ± 3 m high, lvs. l. green, branchlets almost white, calyx and corolla dirty red, silvery haired, fr. dirty yellowish pink, dirty violet with age; nat. n.: *omín'a*).

Distribution: Philippines, Talaud.

Argostemma prob. nov. spec.

Karakelong, Loc. 2, bank of K. Tatamboewe, alt. 50 m, May 7: *n. 2890* (herb, lvs. d. green above, l. green below, petioles slightly succulent, stem, peduncle and calyx l. green, corolla white, flow. and buds pendulous, fr. erect).

Remarks: This species is closely related to the Philippine species *A. Neesianum* Walp., *A. solaniflorum* Elm. and *A. Wallichii* Walp., which all are closely related to *A. montanum* Bl. from Java and Sumatra. Only a monographer can decide here.

Canthium prob. nov. spec.

Karakelong, Loc. 7, top of G. Piapi, low forest, alt. 500 m, June 1: *n. 3293* (small tree, 6 m high, bole 3 m, lvs. bright green, paler below, petioles l. yellowish green, pedicels and calyx green, buds l. green); open forest, alt. 350 m, June 2: *n. 3310* (straight tree, trunk cylindrical, 13 m high, bole 8 m, diam. 0.22—0.15 m, lvs. more or less shining, d. green above, corolla greenish white, anthers d. red, style greenish white, stigma white).

Remarks: Most closely related to Moluccan species.

Chasalia curviflora (Wall.) Thw., Enum. Pl. Zeyl., 1858—'64, 150.

Kaboeroeang, Loc. 5, sec. forest, May 27: *n. 3207* (shrub, 1.5 m high, lvs. shining d. green above, l. green below, infl. greenish white, fr. black, shining, pedicels red; nat. n.: *boenála*).

Distribution: India, Sumatra, Java, Borneo, Philippines, Talaud.

Dolicholobium prob. nov. spec.

Karakelong, Loc. 2, frequent in old forest, alt. 70 m, May 4: *n. 2812* (small tree, lvs. d. green above, paler below, midrib and stipules l. green, pedicels and fr. l. greenish yellow).

Remarks: By the many-nerved leaves and the size of the stipules this species shows more resemblance with the species from New Guinea, than with those from the Philippines. The genus is only known from the Philippines, the Moluccas (Tidore), New Guinea and Polynesia. During the same expedition a specimen was collected in Tidore (*Lam n. 3776*), which is undoubtedly conspecific with the specimen from Karakelong.

Guettarda speciosa L., Sp. Pl., 1753, 991.

Nenoesa, Loc. 11, Garete, cleared forest on limestone, alt. 5 m, frequent, June 14: *n. 3445* (small tree, 3.5 m high, bole 2 m, diam. 0.12—0.10 m, lvs. bright green above, paler below, nerves l. yellowish green, petioles reddish, bracts reddish green, calyx l. green, corolla tube l. green, lobes white; wood used for proa construction; nat. n.: *araróéra*).

Distribution: pantropic.

Gynochthodes prob. nov. spec.

Karakelong, Loc. 7, G. Piapi, old forest, alt. 100 m, June 3: *n. 3332* (liana, ± 2 m long, lvs. shining d. green, l. green below, petioles and nerves yellowish green, calyx and pedicels l. green, tube of corolla greenish white, lobes white, filaments greenish white, anthers black, style greenish white, stigma greenish yellow, ovary l. green, fr. shining d. green; nat. n.: *poendángi*) — Salebaboe, Loc. 3, G. Ajambana, sec. forest, alt. 220 m, May 23: *n. 3137* (liana, ± 10 m high, lvs. shining d. green above, lower surface and petioles paler, calyx and pedicels l. green, corolla white, filaments white, anthers black, ovary l. green).

Remarks: Easily distinguishable from all described species of this genus by the distinctly racemose inflorescences, probably nearest to Philippine species.

Hedyotis vestita R. Br. ex G. Don, Gen. Syst. 3, 1834, 526.

Salebaboe, Loc. 3, G. Ajambana, ladang, alt. 200 m, May 21: *n. 3080* (herb, lvs. l. green, petioles, stem, calyx and ovary very l. green, corolla l. violet).

Distribution: India, S. China and Malay Peninsula to Philippines and Moluccas.

Hydnophytum amboinense Becc., Malesia 2, 1884, 138.

Karakelong, Loc. 2, old forest, alt. 250 m, May 8: *n. 2915* (epiphytic, tuber d. brown without, white within, cavities reddish brown, lvs. yellowish green, paler below, young fr. green, orange-yellow when ripe); Loc. 7, G. Piapi, open sunny slope, alt. 450 m, May 31: *n. 3283* (epiphytic, tuber brownish grey without, white within, cavities brown, lvs. dull green, calyx and corolla l. green in bud, young fr. l. green or greenish white, orange when ripe).

Distribution: Talaud, Moluccas.

Hydnophytum inerme (Gaud.) Brem., comb. nov. — *Myrmecodia inermis* Gaud., Freyc. Voy. Bot., 1826, p. 472, t. 95.

Karakelong, Loc. 2, old forest, alt. 150 m, May 11: *n. 2963* (epiphytic, branchlets brown, tuber l. grey without, white within, cavities bright brown, lvs. d. green above, l. green below, fr. green).

Distribution: Rawah (islet near W. New Guinea) and N.E. New Guinea, Talaud.

Remarks: This specimen belongs to Beccari's *Hydnophytum Gaudichaudii*; as Beccari based his species on the type of Gaudichaud's *Myrmecodia inermis,* the name of the species has to be *Hydnophytum inerme* (Gaud.).

Hydnophytum ?philippinense Becc., Malesia 2, 1884, 125.

Morotai, Loc. 12, old forest, alt. 130 m, very frequent, June 22: *n. 3543* (epiphytic, sessile or pendulous, branchlets brown, tuber greyish brown without, white within, cavities bright brown, lvs. bright green, corolla white, young fr. green; nat. n.: *bóékoh-bóékoh*).

Distribution: Philippines, Morotai.

Remark: As the flowers are lacking, the identification is not fully certain.

Ixora talaudensis Brem. nov. spec. subgeneris *Eu-ixorae,* sectionis *Ixorastri,* series *Macrothyrsarum* a speciebus aliis series huius foliis longius petiolatis, latioribus, nervis pluribus munitis distinguenda, inflorescentia distincte pedunculata uberrima ad *I. tidorensem* accedens, foliis magnis, pedunculo basi foliis rudimentariis munito *I. longifoliæ* similior.

Folia petiolo 20 mm longo munita; lamina oblonga 17—22 cm longa et 6—10 cm lata, apice caudato-acuminata et mucronata, basi contracta et conduplicata, herbacea, subopaca, laete viridis, sicc. supra olivaceo-brunnea, subtus dilute brunnea, costa basin versus impressa, nervis utroque latere 17—19 subtus prominulis, reticulatione satis densa subtus etiam prominula. *Stipulae* truncatae, arista quam vagina breviore munitae. *Inflorescentia* laxa, glabra, e floribus circ. 200 composita. Pedunculus 8—20 mm longus, basi foliis rudimentariis munitus et internodio 2—6 mm longo vel interdum internodiis duobus brevioribus folia rudimentaria gerentibus praecessus. Internodia basalia axis et ramulorum infimorum 20—40 mm longa. Ramuli infimi foliis rudimentariis vel ut alii bracteis ovatis acuminatis patentibus suffulti; bracteae ramulorum ceterorum peripheriam versus magnitudine decrescentes, numquam tamen agnoscendae. Bracteolae basi contracta ovarii insertae et eo breviores, ovato-triangulares. *Flores* laterales triadum pedicellis 1—2.5 mm longis instructi; flores centrales sessiles. *Ovarium* 1.3 mm altum. *Calyx* tubo 0.4—0.5 mm alto, lobis late ovatis tubo subaequilongis, subacutis. *Corolla* tubo 3.7—4.0 cm longo, lobis 7 mm longis et 4 mm latis. *Stamina* filamentis 0.8 mm, antheris 4 mm longis. *Stylus* parte exserta stigmatibus 1.5 mm longis comprehensis 3.5 mm longa. *Drupa* globosa.

Karakelong, Loc. 1, shady place in sec. forest, alt. 90 m, April 24: *n. 2547* (erect shrub, 3.5 m high, peduncles and calyx d. carmine, corolla tube bright carmine, lobes orange red, young fr. green with red apex; nat. n.: *sóéwing'a*; *typus*, L., dupl. Bz.) — Loc. 7, G. Piapi, Pananasaran'a grove, open forest, alt. 350 m, June 2: *n. 3307* (shrub of ± 2.5 m high, infrutescences fiery red, young fr. pale green, black when ripe; nat. n.: *sóéwing'a*) — Kaboeroeang, Loc. 4, frequent in sec. forest, alt. 20 m, May 26: *n. 3185* (shrub, ± 3 m high, twigs often reddish, entire infl. beautiful orange-red; nat. n.: *sóéwing'a*).

Remarks: As most *Ixora* species are confined to small areas, it is, from a geographical point of view, preferable to study the distribution of the series to which they belong. The series *Macrothyrsae* occurs in Celebes and in the Moluccan and Philippine Islands; its occurrence "further eastwards" (Brem., in Bull. Jard. Bot. Buitenzorg, Sér. III, 14, 1937, 221) is doubtful: the plant described from the Carolines is probably an introduced species. The specimen of *Ixora filipes* Valet. (*Lam n. 2423*), erroneously mentioned by Bremekamp (l. c., 1937, 308) from the Talaud Islands, was actually collected in the Minahasa (North Celebes).

Knoxia corymbosa Willd., Sp. Pl. 1, 1797, 582.

Nenoesa, Loc. 10, Merampi, G. Maranggi, alang-alang field, alt. 170 m, June 13: *n. 3436* (undershrub, lvs. l. green, stem brownish, calyx l. green, corolla white, fr. l. green).

Distribution: India to Philippines and Australia.

Remark: What at present is known as *Knoxia corymbosa* is a mixture of many species. The specimens from India, for instance, are distinctly different from those from Malaysia.

Lachnostoma apodum (Valet.), Brem., comb. nov. — *Ixora apoda* Valet., Ic. Bogor. 4, 1912, t. 341.

Morotai, Loc. 12, old forest, alt. 50 m, June 20: *n. 3469* (shrub, ± 0.50 m high, lvs. d. green above, l. green below, fr. bright red in maturity).

Distribution: Moluccas (Morotai, Obi, Ceram, Kai?). The genus is known from the Malay Peninsula, Sumatra, Java, Borneo and the Moluccas.

Morinda citrifolia L., Sp. Pl., 1753, 176.

Karakelong, Loc. 1, sec. forest, alt. 10 m, frequent, April 23: *n. 2492* (shrub or small tree, 2.5 m high, lvs. bright green, stipules green, calyx l. green, tube of corolla greenish white, lobes white, fr. l. green; formerly the roots were used for the production of a yellow dye; nat. n.: *mangkóédoe*) — Miangas, Loc. 9, G. Batoe, in small grove, alt. 80 m, June 11: *n. 3357* (shrub, ± 2 m high, lvs. bright green, paler below, petioles and midrib below greenish white, calyx l. green, corolla greenish white, fr. l. green, almost white with age; nat. n.: *séra*).

Distribution: India to Polynesia.

Morinda prob. nov. spec.

Karakelong, Loc. 7, G. Piapi, open sunny slope, alt. 400 m, May 31: *n. 3270* (liana, lvs. coriaceous, l. green, young fr. green, orange when ripe).

Remarks: This species belongs to the group, which is described by Blume under the generic name *Sphaerophora*; it is most closely related to *M. celebica* Miq. from Indo China, Borneo, Celebes and the Philippines, to *M. Bartlingii* Elm. from Palawan, to *M. parvifolia* Bartl. ex DC. from Indo China, S. China, Formosa and the Philippines, to *M. philippinensis* Elm. from Palawan, Mindoro and Sibuyan and to *M. volubilis* (Blco) Merr. from Luzon.

Mussaenda aff. **philippica** A. Rich., Mém. Soc. Hist. Nat. Paris 5, 1834, 245.

Karakelong, Loc. 1, sec. forest, alt. 10 m, April 23: *n. 2495* (± climbing shrub, 6 m high, calyx greenish white, enlarged lobe almost white, corolla with tube and lobes l. green without, lobes orange within, fr. green; nat. n.: *lalagàlan*) — Loc. 2, bank of K. Tatamboewe, alt. 50 m, May 3: *n. 2774* (climbing, several m long, lvs. l. green, calyx green, lobes paler, corolla orange with yellow margin within, tube and outside l. green); alt. 40 m, May 12: *n. 2964* (same annotations as n. 2774; nat. n.: *lóéngkang*).

Distribution: Philippines, Talaud.

Remarks: The species is closely related to *M. sericea* Bl. and *M. Forsteniana* Miq. from the Moluccas.

Mycetia ?javanica (Bl.) Korth., Ned. Kruidk. Arch. 12, pt. 2, 1851, 118.

Salebaboe, Loc. 3, G. Ajambana, old forest, alt. 320 m, May 23: *n. 3148* (lvs. l. green, paler below, petioles very l. green, fr. fleshy, white).

Morotai, Loc. 12, Marilako, old forest, alt. 20 m, June 29: *n. 3677* (shrub, lvs. d. green above, l. green below, fr. fleshy, greyish white).

Distribution: recorded from the Malay Peninsula to the Philippines and New Guinea, but the specimens from the Malay Peninsula, the Philippines and New Guinea may well belong to other species.

Remark: The identification is not perfectly certain on account of the incompleteness of the material.

Myrmecodia prob. nov. spec. (1).

Karakelong, Loc. 1, sec. forest, alt. 80 m, April 24: *n. 2549* (epiphytic, tuber brown, greenish towards the apex, lvs. l. green, petioles paler, corolla white, fr. yellowish orange; nat. n.: **wáring garàtoe*) — Loc. 2, Pasir Malap, bank of K. Bahewa, alt. 20 m, very frequent, May 14: *n. 3020* (same annotations as in n. 2549, tuber greenish white within, cavities brown) — Loc. 7, G. Piapi, open forest, alt. 350 m, June 2: *n. 3324* (same annotations as in n. 3020).

Remarks: Closely related to *M. goramensis* Becc. from the Moluccas, but distinctly different by the tuber, which is naked or provided with feeble spinules only. *M. Rumphii* Becc. from the Moluccas and *M. sibuyanensis* Elm. from the Philippines are also pretty closely related.

Myrmecodia prob. nov. spec. (2).

Morotai, Loc. 12, Marilako, frequent in old forest, alt. 20 m, June 28: *n. 3663* (epiphytic, sessile, tuber l. greyish green without, white within, cavities l. brown, lvs. bright green, petioles much paler, corolla white; nat. n.: *bóékoh-bóékoh*).

Remarks: Distinct from all described species by the indistinct leafscars, probably related to *M. apoensis* Elm., which also possesses branched spines.

Myrmephytum prob. nov. spec.

Morotai, Loc. 12, Goegoeti, G. Ligòjer, old forest, alt. 100 m, June 24: *n. 3602* (epiphytic, stem d. brown, tuber spineless, d. greyish brown without, white within, cavities bright brown, lvs. d. green above, l. green below, fr. l. green when young; tuber inhabited by large black ants; nat. n.: *bóékoh-bóékoh*).

Remark: As far as we are aware, only two species of this genus are known, one from Celebes and one from the Philippines (Sibuyan).

Nauclea mitragyna (Miq.) Brem., comb. nov. — *Sarcocephalus mitragynus* Miq., Ann. Mus. Bot. Lugd.-Bat. 4, 1868—'69, 180.

Karakelong, Loc. 1, sec. forest, alt. 40 m, April 24: *n. 2536* (small densely branched tree, 4 m high, lvs. shining green above, l. green below, nerves paler, young infl. green, corolla tube white, lobes l. yellow; nat. n.: *antáloet*); wayside, in sec. forest, alt. 100 m, April 27: *n. 2655* (straight tree, ± 13 m high, diam. 0.30 m, lvs. l. green, calyx very l. green, corolla greenish yellow, thecae l. brown, connective d. brown, style and stigma white; nat. n.: *antáloet'a*).

Distribution: Moluccas (Ambon, ? Ceram), Talaud, probably also in the Philippines.

Remarks: The plants from the Philippines recorded under the names of *N. Junghuhnii* (Miq.) Merr. and *Sarcocephalus Horsfieldii* Elm. very probably belong to this species. *N. Junghuhnii* from Sumatra and the Malay Peninsula, *N. subdita* (Miq.) Brem. comb. nov. from Sumatra, Java, Borneo and perhaps the Malay Peninsula and *N. multicephala* (Elm.) Merr. from the Philippines are closely related. *N. Horsfieldii* (Miq.) is a species of doubtful relationship, Haviland unites it with *N. cordata*, but he has not studied the type, which is probably in Kew, at least he does not cite it.

Oldenlandia biflora L., Sp. Pl., 1753, 119.

Salebaboe, Loc. 3, G. Ajambana, frequent on ladang, alt. 150 m, May 21: *n. 3082* (± prostrate herb, lvs. and petioles bright green, stems slightly violet at base, calyx green, corolla white, fr. l. green, darker with age) — Miangas, Loc. 9, G. Soro, open grass slope, alt. 60 m, frequent, June 11: *n. 3399* (same annotations as n. 3082; nat. n.: *nenàpoe*).

Distribution: tropical Asia to Polynesia.

Oldenlandia pterita (Bl.) Miq., Fl. Ind. Bat. 2, 1857, 193.

Karakelong, Loc. 8, north of Poeloetan, wayside, alt. 5 m, June 4: *n. 3345* (herb, entire plant l. green, stems often slightly violet, calyx pale green, corolla white, fr. l. green; nat. n.: **padóéoet oe papóéa*).

Distribution: India, Indo China, Sumatra, Java, Borneo, Celebes, Philippines, Talaud, Timor.

Ophiorrhiza parviflora Reinw. ex Korth., Ned. Kruidk. Arch. 2, pt. 2, 1851, 127.

Karakelong, Loc. 1, partly cleared old forest, alt. 90 m, April 26: *n. 2634* (undershrub, lvs. d. green above, l. green below, midrib and petiole violet, fr. violet-green) — Loc. 2, old forest, along rivulet, alt. 50 m, May 1: *n. 2719* (same annotations as n. 2634).

Distribution: Salajar, Celebes, Talaud.

Remark: Since flowers are wanting, the determination is somewhat uncertain.

Ophiorrhiza prob. nov. spec. (1).

Karakelong, Loc. 1, partly cleared forest, alt. 40 m, April 25: *n. 2566* (undershrub, lvs. green, paler below, calyx brownish violet, peduncles l. green, corolla greenish white, lobes almost white, style brownish violet, stigma white; nat. n.: *omín'a*) — Salebaboe, Loc. 3, G. Ajambana, skirt of sec. forest, alt. 150 m, May 21: *n. 3079* (shrub, stem creeping, greyish brown, peduncle and calyx l. green, fr. d. green).

Morotai, Loc. 12, Marilako, old forest, alt. 20 m, June 28: *n. 3659* (undershrub, lvs. dull d. green above, l. green below, fr. l. green).

Remark: This species shows some affinity to *O. neglecta* Bl. from Java and Sumatra, but more to *O. venosa* Merr. from the Philippines.

Ophiorrhiza nov. spec. (2).

Morotai, Loc. 12, old forest, alt. 40 m, June 20: *n. 3488* (undershrub, lvs. dull d. green above, very l. green below, stem green, calyx and bracts l. green, corolla white, fr. green); Goegoeti, G. Ligòjer, old forest, alt. 80 m, June 24: *n. 3591* (same annotations as n. 3488).

Remarks: Undoubtedly a new species, showing some resemblance to *O. quadrifida* Bl. from Java. Probably more closely related to *O. involucrata* Elm. from the Philippines.

Psychotria leptothyrsa Miq., Ann. Mus. Bot. Lugd.-Bat. 4, 1868, 208.

Karakelong, Loc. 2, old forest, alt. 40 m, May 3: *n. 2768* (shrub, ± 1 m high, lvs. bright green above, l. green below, petioles reddish, young branchlets greenish red, sometimes yellowish, calyx dirty red, corolla l. yellow, anthers yellowish orange, style dirty red, stigma green, fr. l. green and dirty red).

Morotai, Loc. 12, Marilako, old forest, alt. 20 m, frequent, June 28: *n. 3650* (shrub, ± 2 m high, lvs. as in n. 2768, calyx dirty violet).

Distribution: with certainty known from the Moluccas, Talaud and the Philippines. The records from Java and New Guinea are not correct, since the specimens from those islands belong to other species.

Psychotria aff. **sarmentosa** Bl., Bijdr., 1825, 964.

Salebaboe, Loc. 3, G. Ajambana, old forest, alt. 320 m, May 23: *n. 3149* (liana, lvs. d. green above, l. green below, calyx and corolla l. green in bud).

Distribution: *P. sarmentosa* is probably restricted to western Malaysia, most of the specimens from the eastern part proved to belong to still undescribed species.

Remark: This specimen differs from *P. sarmentosa* by having conspicuous raphide bundles in the leaves.

Psychotria prob. nov. spec. (1).

Karakelong, Loc. 7, G. Piapi, frequent on open sunny slope, alt. 400 m, May 31: *n. 3252* (small tree, ± 4 m high, lvs. bright green, paler below, petioles greenish white, calyx l. green, corolla and ovary greenish white, fr. l. green when young, orange-yellow with age, black in maturity); open forest, alt. 300 m, June 2: *n. 3306* (shrub, ± 2 m high, lvs. shining bright green, midrib greenish white below, petioles l. green, branchlets greyish brown, peduncles l. green, corolla white; nat. n.: *maloempèt'a*).

Remark: The species shows some resemblance with *P. lagunensis* (Merr.) Merr., from the Philippines (Luzon, Polillo, Dinagat) but is not conspecific.

Psychotria prob. nov. spec. (2).

Morotai, Loc. 12, old forest, alt. 100 m, June 21: *n. 3512* (liana, ± 2.5 m long, lvs. d. green above, l. green below, peduncles l. green, calyx and corolla white, stigma brown, fr. white).

Remarks: Shows some resemblance with *P. sarmentosa* Bl. from western Malaysia and with *P. vulcanica* Elm. from Luzon, but differs from both in the granulate surface of the leaves. The above specimen is conspecific with a specimen from Ceram (*Rutten n. 2237*).

Psychotria prob. nov. spec. (3).

Morotài, Loc. 12, old forest, alt. 130 m, June 22: *n. 3535* (curved tree, 7 m high, bole 4 m, diam. 0.12—0.08 m, trunk cylindrical, black with greyish green spots, lvs. d. green, l. green below, fr. reddish orange, persistent calyx dirty green; nat. n.: *kohàka*).

Remark: Fairly closely related to the Philippine species *P. papillata* (Merr.) Merr. and *P. pilosella* Elm., but different from both.

Randia multiflora Koord. & Valet., Meded. 's Lands Plantent. Buitenzorg, 59, 1902, 88.

Karakelong, Loc. 2, old forest, alt. 100 m, April 30: *n. 2698* (liana, lvs. dull green above, slightly paler below, petioles brownish green, pedicels and calyx l. green, sepals paler towards the tips, corolla tube l. green at base, the rest white, anthers and stigma brownish white, flow. fragrant; nat. n.: *ganggáila *ahoerángan*).

Distribution: not fully known; recorded from a large part of Malaysia, closely related to *R. uncaria* Elm. from the Philippines.

Remarks: This species is identical with *Posoqueria multiflora* Bl., which Blume incorrectly interpreted as being the same species as *Gardenia multiflora* Willd., a synonym of *Randia longiflora* Lam. Therefore Blume's name is illegitimate. The name *Randia multiflora* Koord. & Valet. (1902)

can be considered a new name for the species, as there is no other name given to it before 1902.

Timonius ?celebicus Koord., Nat. Tijdschr. Ned. Ind. 63, 1903, 87.

Karakelong, Loc. 1, skirt of forest, alt. 100 m, April 25: *n. 2587* (tree, 8 m high, diam. 0.14 m, trunk irregularly furrowed, bark l. greyish brown, scaling, lvs. bright green, darker above, stipules shining hairy, yellowish green, calyx l. green, corolla l. yellow; nat. n.: **bambalóéda*) — Kaboeroeang, Loc. 4, Lapean'a forest reserve, frequent in cleared old forest, alt. 75 m, May 26: *n. 3176* (straight tree, 13 m high, bole 10 m, diam. 0.22—0.12 m, trunk cylindrical, branchlets brown, lvs. shining brown hairy when young, d. green above, l. green below when adult, dull, nerves and petioles brownish green, calyx l. green, margins l. brown, corolla l. greenish yellow; wood used for house construction; nat. n.: *bambaróéda*).

Distribution: Celebes, Talaud.

Remarks: The identification is not fully certain by lack of comparing material and also since the description of the species was made after a fruiting specimen.

Uncaria longiflora (Poir.) Merr., Interpret. Herb. Amb., 1917, 480.

Karakelong, Loc. 2, old forest, alt. 60 m, May 4: *n. 2825* (liana, lvs. d. green above, l. green below, nerves paler, fr. l. yellowish green; nat. n.: *ganggáil'a*).

Distribution: not fully certain, but probably restricted to eastern Malaysia (Philippines, Talaud, Moluccas) and replaced by related species (such as *U. pteropoda* Miq.) in the western part.

Uncaria pedicellata Roxb., Fl. Ind., ed. 1, 2, 1824, 128.

Salebaboe, Loc. 3, G. Ajambana, alt. 220 m, May 23: *n. 3153* (liana, lvs. shining d. green above, ± bullate, l. green below, stem, petioles, hooks and peduncles ± ferruginously pubescent, calyx and pedicels l. brown, buds l. green).

Morotai, Loc. 12, old forest, alt. 20 m, June 28: *n. 3655* (liana, nerves of lvs. brown below, calyx l. yellowish green, ovary l. brownish green; nat. n.: *abéteh*).

Distribution: Tenasserim to New Guinea.

Uncaria setiloba Benth., Lond. Journ. Bot. 33, 1897, 84.

Morotai, Loc. 12, Goegoeti, riverbank, alt. 40 m, June 26: *n. 3624* (climbing in shrubs on riverbank, lvs. d. green above, paler below, petioles and midrib reddish above, calyx l. green, corolla tube dirty yellowish green or slightly brownish red, lobes yellowish green, anthers brown, style yellowish green, stigma green; nat. n.: *hohinínga*).

Distribution: Moluccas (Morotai, Ceram, Ambon); closely related species occur in the Philippines.

Uncaria spec.

Karakelong, Loc. 1, cleared old forest, alt. 100 m, April 26: *n. 2621* (liana, stems yellowish green, infl. entirely l. green; nat. n.: *ganggáil'a*).

Remarks: This specimen differs from *U. setiloba* from the Moluccas by having almost glabrous leaves. It shows resemblance to *U. castellata* Elm. inedit. from Mindanao, which is incorrectly combined with *U. philippinensis* Elm.

CUCURBITACEAE

Gynostemma pedatum Bl., Bijdr., 1825, 23.

Morotai, Loc. 12, Goegoeti, riverbank, alt. 40 m, June 26: *n. 3625* (twining, several m long, lvs. d. green above, lower surface and petioles paler, infl. green; nat. n.: *ròtoe-ròtoe*).

Distribution: India to Japan, Philippines and New Guinea.

Momordica cochinchinensis (Lour.) Spreng., Syst. 3, 1826, 14.

Morotai, Loc. 12, Marilako, skirt of old forest, alt. 20 m, June 28: *n. 3646* (twining, ± 10 m long, lvs. bright green, buds l. green, fr. l. green, bracts yellow with age; nat. n.: *toròhoekoe*).

Distribution: India and China to Philippines and New Guinea.

GOODENIACEAE

Scaevola frutescens (Mill.) Krause in Engl., Pflanzenr. 54, 1912, 125, fig. 25.

Karakelong, Loc. 1, beach, alt. 0.5 m, frequent, April 23: *n. 2481* (dense shrub, 2.5 m high, lvs. l. green, midrib and petioles greenish white, calyx l. green, corolla green without, white within, margins violet, style, ovary and young fr. l. green, stigma greenish white; nat. n.: *kanoembóélan'a*) — Nenoesa, Loc. 10, Merampi, limestone, 100 m alt., June 13: *n. 3425* (shrub, ± 2 m high, same annotations as n. 2481, fr. green, white with age; juice used as medecine against eye-affections by dropping it into the eye; nat. n.: *panimbóéran'a*) — Miangas, Loc. 9, beach, alt. 1 m, very frequent, June 11: *n. 3375* (same annotations as n. 2481).

Distribution: Madagascar to Polynesia.

Scaevola micrantha Presl, Rel. Haenk. 2, 1830, 59.

Karakelong, Loc. 7, G. Piapi, very frequent in open sunny slope, alt. 300 m, May 31: *n. 3266* (shrub, 0.5—2 m high, lvs. dull d. green with paler midrib above, peduncles and calyx green, corolla tube green, lobes violet without, white within, filaments white, anthers l. brown, style l. green, stigma violet-brown, tip white, fr. l. green, black when ripe; nat. n.: *panimbóéran'a*).

Distribution: Philippines, Talaud.

COMPOSITAE (J. Th. Koster)

Adenostemma Lavenia (L.) O. Ktze, Rev. Gen. Pl., 1891, 304; Koster, Blumea 1, 1935, 470.

Salebaboe, Loc. 3, G. Ajambana, very frequent on ladang, alt. 150 m, May 21: *n. 3088* (entire plant bright green, corolla white).

Distribution: India to Polynesia.

Ageratum conyzoides L., Sp. Pl., 1753, 839; Koster, l.c. 484.

Karakelong, Loc. 1, alang-alang field, alt. 100 m, April 25: *n. 2604* (lvs. and involucre l. green, corolla white, somewhat lilac; nat. n.: **radóéoet oe manáro*).

Distribution: a native of tropical America, now pantropic.

Bidens chinensis (L.) Willd., Sp. Pl. 3, 1804, 1719.

Karakelong, Loc. 1, alang-alang field, alt. 120 m, April 27: *n. 2619* (herb, lvs. dull green, darker above, with stem and petioles often slightly violet, involucre l. green, ray-flow. l. yellow, disc-flow. bright yellow, fr. d. green, spines l. green; nat. n.: *dandí'it*).

Distribution: paleotropic.

Blumea balsamifera (L.) DC., Prodr. 5, 1836, 447.

Karakelong, Loc. 1, alang-alang field, alt. 100 m, April 27: *n. 2660* (stout herb, 1.7 m high, lvs. green, white tomentose, involucre l. green, white tomentose; nat. n.: *maransàm'a*).

Distribution: India and S. China to Philippines, Moluccas and Lesser Sunda Islands.

Blumea lacera (Burm. f.) DC., Prodr. 5, 1836, 436.

Karakelong, Loc. 1, alang-alang field, alt. 100 m, April 25: *n. 2591* (lvs. l. green, involucre l. green, corolla yellow; nat. n.: *sasaráwi*).

Distribution: tropical Africa to New Caledonia.

Blumea laciniata (Roxb.) DC., Prodr. 5, 1836, 436.

Karakelong, Loc. 2, on recent landslide, alt. 50 m, May 11: *n. 2958* (herb, entire plant bright green, involucre green, corolla yellow).

Distribution: India to Philippines and New Guinea.

Emilia sonchifolia (L.) DC., Prodr. 6, 1837, 302.

Karakelong, Loc. 1, alang-alang field, alt. 100 m, April 25: *n. 2596* (erect herb, lvs. bluish green, involucre l. green, corolla l. violet; nat. n.: *liléwan katowàn'a*).

Distribution: pantropic.

Vernonia cinerea (L.) Less., Linnaea 4, 1829, 291; Koster, Blumea 1, 1935, 407.

Karakelong, Loc. 1, alang-alang field, alt. 100 m, April 25: *n. 2589* (involucre green, corolla white).

Distribution: originally paleotropic, now pantropic.

Vernonia lanceolata (Warb.) Mattf., Engl. Jahrb. 62, 1929, 401; Koster, l.c. 418.

Karakelong, Loc. 1, wayside, alt. 30 m, April 26: *n. 2630* (herb, 1.5 m high, lvs. l. green, petioles and midrib somewhat reddish, involucre green, corolla l. lilac, pappus white).

Distribution: Talaud, Moluccas, New Guinea, New Ireland.

Wedelia biflora (L.) DC. in Wight, Contrib. Bot. Ind., 1834, 18.

Karakelong, Loc. 1, frequent in sec. forest, April 23: *n. 2477* (± prostrate, some m high, involucre green, ray-flow. yellow, disc-flow. darker; nat. n.: *natóénoe*) — Miangas, Loc. 9, coconut plantation, alt. 10 m, June 11: *n. 3394* (herb, more or less climbing, dull green, lower surface and petioles paler, involucre green, ray-flow. bright yellow, disc-flow. darker; nat. n.: *daróénoe*).

Distribution: India to Polynesia.

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Addendum:

GENERAL PART, Literature (p. 145):

UMBGROVE, J. H. F., Corals from an elevated marl of Talaud (East Indies) — Zoolog. Meded. XX, 1938, 263—274.

AN HISTORICAL REVIEW OF THE IDENTIFICATION OF THE NETHERLANDS' CHAROPHYTA

by

J. S. ZANEVELD

(Rijksherbarium, Leiden).

In 1938, Verdam published an account of the then-known Charophyta of the Netherlands in the English language (cf. this journal, vol. 3), and one year later (1939) another in our own language in "Nederlandsch Kruidkundig Archief". In both papers reference was made to only five Netherlands' publications on the same subject, the oldest of which is dating from 1846. In studying i.a. the history of the Malaysian Charophyta (Zaneveld, 1940) I found that much more was published on the Charophyta of our Low Countries. As will be seen below, it became evident that the first printed record of a Netherlands' Charophyte dates as far back as 1636. It seems worth while to publish these notes on the history of the identification of our Charophyta as, moreover, a number of additional facts have become known.

The data of the present review have been taken from the following sources (chronologically arranged): 1. herbals; 2. catalogues of Botanic Gardens; 3. local floras; 4. general floras and taxonomic textbooks; 5. monographs.

I. The XVIth and XVIIth centuries.

1. Data from herbals. The well-known Netherlands' physician, Rembertus Dodoens or Dodonaeus (*1516, †1585), in 1582 appointed professor of botany at the Leiden University, was the first to draw attention in our own language (instead of the usual Latin) to a foreign plant, which afterwards was identified as *Chara vulgaris* L. Properly speaking, this was not done by Dodoens himself, but by J. van Ravelingen, who translated and revised Dodoens' "Stirpium historiae Pemptades sex" of 1583 and published it under the name of "Cruydt-Boeck". In the 2nd and 3rd revisions of 1618 and 1644 respectively — not in the first of 1608 — reference is made to the "Stinckende Peerdsteert-cruydt" (Stinking Water-Horsetail), described in 1596 by C. Bauhin in the "Phytopinax" as *Equisetum olidum.* The superficial resemblance of the vegetative parts and the occurrence in the same habitat were reasons for formerly placing the Charophyta under the genera *Equisetum* or *Hippuris.*

A corresponding notation is to be found in two herbals of professor Abraham Munting (*1626, †1683) of Groningen, entitled "Waare Oeffening der Planten", edited in 1672, a very useful treatise on general botany, and "Naauwkeurige Beschryving der Aardgewassen", printed in 1696, 13 years after the author's death. In both herbals mention is made to an *Equisetum album tenuifolium minimum,* which was collected at Peize (province of Drente) about 1680. As in the case of Dodoens, the descriptions are too insufficient to identify the species, but there is hardly any doubt that a *Chara* was meant.

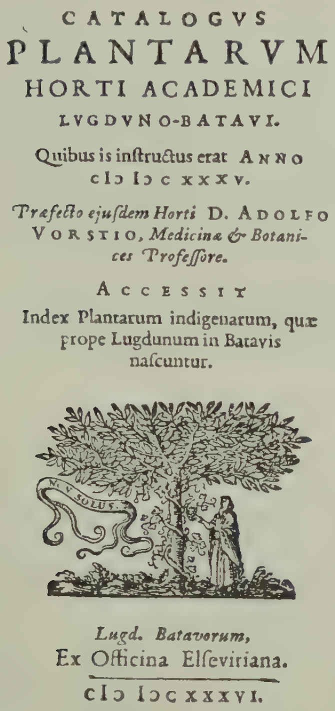
2. Data from catalogues of Botanic Gardens. In both centuries the catalogues of the Leiden University Gardens are of primary importance for the knowledge of the occurrence of indigenous plants. The original garden, dating from 1587 (cf. Veendorp & Baas Becking, 1938), issued its first catalogue in 1594, but only in that of 1636 the first Charophyte is mentioned. This catalogue, entitled "Catalogus Plantarum Horti Academici Lugduno-Batavi", published by Adolf de Vorst (Adolf Vorstius, *1597, †1663, professor at Leiden 1625—'63), contains an appendix, in which the wild flora of the neighbourhood of Leiden has been enumerated. In this "Index Plantarum indigenarum, quae in locis paludosis, pratensibus, arenosis, & sylvestribus prope Lugdunum in Batavis nascuntur", one may read on p. 57: "*Equisetum foetidum sub aqua repens Bauh.*". Under this name C. Bauhin published in 1620 a plant, which, on account of its simultaneously published figure, could be identified as *Chara vulgaris* L. As this paper and the second edition of De Vorst's catalogue are very rare, the picture and the accompanying part of the text are reproduced here. In his first edition (1633) the plant was not yet cited. It will be seen from the reproduction that the arrangement of the plants in this catalogue is merely alphabetical and that no particular system is used.

The same plant is mentioned by the same name in the Leiden Gardens' catalogue of 1668 by Florens Schuyl (*1619, †1669), Horti Praefectus from 1667—'69, and also in Paul Hermann's catalogue (*1640, †1695, praefectus from 1680—'95) of the Leiden Hortus, printed in 1687. In both publications the alphabetical arrangement has been maintained.

3. Data from local floras. As far as I am aware, the first publication in which the flora of a certain locality is enumerated, is that by Hendrik Bruman (*?, †1679), Rector of the Latin Schools at Zwolle. In 1662 he published an: "Index stirpium quae prope Zuollam in Transisalania nascuntur". On p. 8 of this alphabetically arranged "Index" *Equisetum foetidum pallustre* is mentioned, another phrase name for *Chara vulgaris* L., which was detected in the vicinity of Zwolle (province of Overijsel).

Fig. 1 (above). — DE VORST's catalogue of 1636: title-page, and part of the text, on which the first Netherlands' Charophyte was mentioned (nat. size).

Fig. 2 (below). — Reproduction of the oldest-known illustration of any Charophyte, probably *Chara vulgaris* L., with accompanying text. From C. BAUHIN, 1620, p. 25 (nat. size).



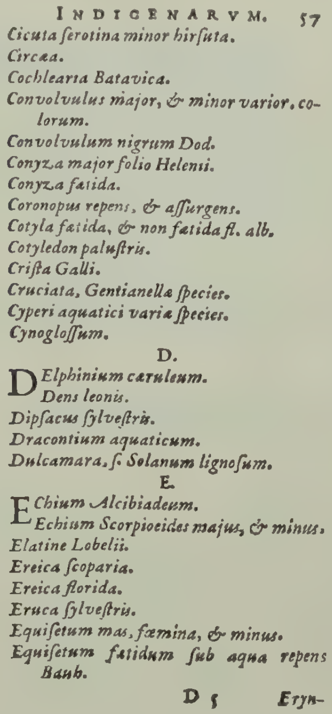
CATALOGUS
PLANTARUM
HORTI ACADEMICI
LUGDUNO-BATAVI.

Quibus is inſtructus erat ANNO
cIↄ Iↄc xxxv.

Præfecto ejuſdem Horti D. ADOLFO
VORSTIO, *Medicinæ & Botanices Profeſſore.*

ACCESSIT
Index Plantarum indigenarum, quæ
prope Lugdunum in Batavis
naſcuntur.

Lugd. Batavorum,
Ex Officina Elſeviriana.
cIↄ Iↄc xxxvi.



INDIGENARUM. 57

Cicuta ſerotina minor hirſuta.
Circæa.
Cochlearia Batavica.
Convolvulus major, & minor varior. colorum.
Convolvulum nigrum Dod.
Conyza major folio Helenii.
Conyza fætida.
Coronopus repens, & aſſurgens.
Cotyla fætida, & non fætida fl. alb.
Cotyledon paluſtris.
Criſta Galli.
Cruciata, Gentianellæ ſpecies.
Cyperi aquatici variæ ſpecies.
Cynogloſſum.

D.

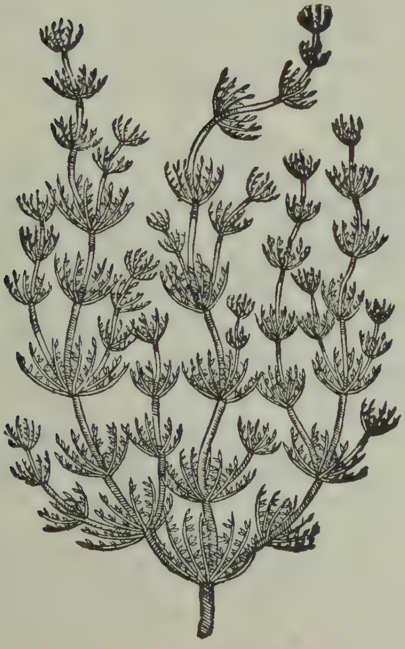
DElphinium cæruleum.
Dens leonis.
Dipſacus ſylveſtris.
Dracontium aquaticum.
Dulcamara. ſ. Solanum lignoſum.

E.

EChium Alcibiadeum.
Echium Scorpioeides majus, & minus.
Elatine Lobelii.
Ereica ſcoparia.
Ereica florida.
Eruca ſylveſtris.
Equiſetum mas, fæmina, & minus.
Equiſetum fætidum ſub aqua repens Bauh.

D 5 *Eryn-*

Equiſetum fœtidum ſub aqua repens.



V. EQUISETUM fœtidum ſub aqua repens: Radice eſt fibroſa, caulibus tenuiſſimis, rotundis, per obliquum, vt Saccharum penidium, ſtriatis, geniculatis, fragilibus per terram ſparſis, quandoq, cubitalibus, in plures cauliculos brachiatis, folijs aliquot breuibus, in breues apices diſtinctis, ad genicula iunctis. Tota planta fragilis, quæ aquis cœnoſis dũ innatat viridis eſt, at extracta & exiccata, incana & friabilis, ita vt non ſolum digitis in puluerẽ comminui poſſit ſed ſponte in puluerem abeat. Odoris eſt lutoſi & ſulphurei. Solum in aquis cænoſis demerſum reperitur, quod primum Patauij in foſſis Thermarum Aponitarum: dein non longe Lucerna: tum Baſileæ cis póntem Birſæ, Michelfeldæ & Hunnigæ, in foſſis obſeruauimus.

4. Data from general floras. For the first time a general review of the Netherlands' flora was published in 1683 by Johannes Commelijn (Joannes Commelinus, a commercial man, *1629, †1692). On p. 31 of his alphabetically arranged "Catalogus Plantarum Indigenarum Hollandiae" *Equisetum foetidum sub aqua repens* is mentioned, occurring in the "waters and ditches". The exact locality is not known, but is probably situated in the province of Noord-Holland, as, in his later years, Commelijn possessed a country-seat near Haarlem, from which excursions were made.

Surveying the seventeenth century we may state that the knowledge of the Charophyta and their distribution was still very poor. During the whole century *Chara vulgaris* L. was the only species known.

II. The XVIIIth century.

1. Data from catalogues of Botanic Gardens. In this century the first mention of any Charophyte is found again in a catalogue of the Leiden Botanic Gardens. In 1710, the famous medical and botanical professor, Herman Boerhaave (*1668, †1738), edited his "Index Plantarum", in which *Equisetum foetidum sub aqua repens* is again cited. In this catalogue the plants are not arranged alphabetically, but mainly in accordance with the systems of Ray and Tournefort. *Chara,* under the name of *Equisetum,* is cited under the "*Plantae Apetalae*".

Quite an event in this century was the visit of Linnaeus to Holland from 1735 until 1738, where he took his doctor's degree at the Harderwijk University and, afterwards, became a student at the University of Leiden. Through Boerhaave, Linnaeus was introduced to Georges Clifford, English Envoy at Amsterdam, who possessed the country-seat "Hartecamp" in the neighbourhood of Haarlem, where a number of exotic plants were cultivated. Here the "Hortus Cliffortianus" was prepared, which was published at Amsterdam in 1737.

In this book also a number of indigenous plants is inserted, among them on p. 477 *Chara caulibus aculeatis,* "crescit in fossis minoribus frequentissima per Hollandiam". The genus *Chara* is placed in Classis XXIV, *Cryptogamia,* under the *Algae,* the same position in which we find it in the first editions of Linnaeus's other works (Gen. Plant., Flor. Lapp., Flor. Suec.). The name *Chara,* printed here for the first time in a publication on Netherlands' plants, was used in accordance with Vaillant, the author of the name *Chara* (1719). In the first edition of the "Species Plantarum" (1753), the starting point of the nomenclature for the Algae, this species is named *Chara vulgaris.*

The successor of Boerhaave as a professor in Botany and Medicine and as a praefect of the Leiden Hortus was Adriaan van Royen (* 1704, † 1779), under whose directorate the Gardens were much enlarged. A new catalogue, entitled: "Flora Leydensis Prodromus", was published in 1740 in which two *Chara*'s are mentioned, viz. *Chara caulibus aculeatis* on p. 214 and *Chara caulibus laevibus* on p. 533 (appendix). They have now to be named *Chara hispida* L. and *Chara vulgaris* L. respectively. *Chara* was treated as a genus of the *Algae* and placed in his Classis XIX, "*Cryptantherae*".

In 1747, in "Horti Ultraiectini Index", a catalogue of the Utrecht University Garden published by professor Van Wachendorff (* 1702, † 1758), four species of *Chara* are mentioned, viz.: 1. *Chara caulibus laevibus* (modern name *C. vulgaris* L.); 2. *Chara aculeis caulinis ovatis* (now *C. tomentosa* L.); 3. *Chara aculeis caulinis capillaribus* (now *C. hispida* L.); 4. *Chara caulium articulis inermibus, diaphanis: superne latioribus* (now *Nitella flexilis* [L.] Ag.). The genus *Chara* is again mentioned under the *Algae* in the Class "*Cryptanthae*". Although Van Wachendorff did not mention it particularly we have to assume that the plants were cultivated. It is a remarkable coincidence that the same four *Chara* species are quoted in the Flora Suecica by Linnaeus, which was published two years earlier.

3. Data from local floras. A well-known flora of the eighteenth century is the "Flora Frisica" by David Meese (*1723, †1770), curator of the University Garden of Franeker, edited in 1760. In this little book the Linnean classification is followed, but not his binomial nomenclature. For the province of Friesland two species (nos 504 and 505) are recorded, viz. *Chara caulibus laevibus* (= *C. vulgaris* L.) and *Chara aculeis caulinis capillaribus confertis* (= *C. hispida* L.).

The most prominent man in the second part of this century is David de Gorter (*1717, †1783), professor at the University of Harderwijk (1743—'54) and personal physician (1754—'64) to the empress Elizabeth of Russia. In his first local flora, "Flora Gelro-Zutphanica", published in 1745, only one Charophyte is mentioned, viz. *Chara caulibus aculeatis* (now *C. hispida* L.), collected in pools near the IJsel river. In De Gorter's "Flora Zutphanica" of 1781 another species is mentioned, viz. *Chara vulgaris,* collected in similar habitats. In this book the genus *Chara* is no longer arranged under the *Algae,* but, probably in accordance with Reichard's posthumous (7th) edition of the Genera Plantarum of 1778, under the *Monandria* of Class XXI, *Monoecia.* At the time the antheridia were considered stamina and the oogonia pistils.

Much more important than these local floras are the general ones of De Gorter, which will be described in the following paragraph.

4. Data from general floras and taxonomical textbooks. In his first general flora, the "Flora Belgica" of 1767, De Gorter mentions two species, *Chara vulgaris* L. and *Chara hispida* L., both under their phrase and Linnean names. These species are also enumerated in De Gorter's principal work, the "Flora VII Provinciarum Belgii Foederati indigena", published in 1781, being an account of all the then-known Netherlands' wild-growing plants and their localities.

The second edition of 1814 did not give any more annotations on the genus *Chara.* The fact that De Gorter did not mention the two other *Chara* species of Van Wachendorff, viz. *Chara tomentosa* and *Nitella flexilis,* corroborate the supposition that these must be considered cultivated ones.

Another work on taxonomic botany and zoology, is "Natuurlyke Historie" by M. Houttuyn (*1720, †1794, a physician at Hoorn). It is a translation and revision in the Netherlands' language of Linnaeus's Species Plantarum. Consequently, it is of minor importance for the identification of our flora, as nothing has been said about localities. The same four Charophyta, already cited by Van Wachendorff, are mentioned here (Part 2, 14, 1783). It must be noticed that Houttuyn gives original Netherlands' names which, however, have not come into general use.

Surveying the eighteenth century we may state that only one species had been added to the wild Charophyta flora, viz. *Chara hispida* L. Two other species were mentioned for the first time, viz. *Chara tomentosa* L. and *Nitella flexilis* (L.) Ag. which, however, must be considered cultivated. The number of localities had greatly increased.

As to the place in the system, we observe a regression in the conception, since the Charophyta were no longer considered *Algae* but *Phanerogamae*.

III. The XIXth century.

1. Data from catalogues of Botanic Gardens. In this century the significance of this kind of sources decreases, whereas that of the local floras is raised. As far as I know, there is only one catalogue containing a Charophyte, viz. that by S. J. Brugmans (*1763, †1819), professor at the Leiden University. It was printed in 1819 and contains only one *Chara*, viz. *C. vulgaris* L. (p. 35). It is mentioned under the *Monoecia Monandria*.

Deviating from the sequence hitherto followed, we will at present first review the general works of this century.

2. Data from general floras and taxonomic textbooks. Following Persoon's "Synopsis Plantarum" (1805), H. Schuurmans Stekhoven (*1757, †1839), at first horticulturist, later on curator at the Leiden Gardens, published, in 1815 a synopsis on the *Plantae Phanerogamicae,* followed in 1818 by a similar work on the *Plantae Cryptogamicae.* These were written both in the Latin and in the Netherlands' languages. The same two species as mentioned in De Gorter's floras are cited here and, with one exception, the same localities. According to Persoon's Synopsis, the genus *Chara* is arranged under the *Monoecia Monandria.*

A work of far-reaching importance for the development of the knowledge of the Netherlands' flora is the "Flora Belgii Septentrionalis" by professor H. C. van Hall (*1801, †1874) of Groningen. The Phanerogams were published in Part I in 1825 and 1836, the Cryptogams in Part II in 1832 and 1840. In Part I the plants are arranged according to the sexual system of Linnaeus and, consequently, the Charophyta are mentioned here. Only two species are inserted, viz. *Chara vulgaris* L. and *C. hispida* L.

In Part II of this flora, containing the Cryptogams, the Charophyta are again described (1840), this time by F. A. W. Miquel (*1811, †1871), later professor at Utrecht and at the same time director of the Rijksherbarium at Leiden. The Charophyta are extensively treated and in the introduction it is explained that they have to be considered Cryptogams, forming a separate order "*Charinae*", for which the Netherlands' popular name "*Kranswieren*" (Whorled Algae) was chosen, a very appropriate name, which is still in use.

Miquel distinguishes two genera, viz. *Nitella* and *Chara*, and of these the following species are described (the author's name being often omitted): *N. flexilis* Ag. (present name *N. flexilis* [L.] Ag.); *N. mucronata* (now *N. mucronata* [A. Br.] Miquel [1]); *N. mucronata β nidifica* (now *Tolypella prolifera* [A. Br.] v. Leonh.); *N. syncarpa* (now *N. syncarpa* [Thuill.] Chevall.); *C. hispida* L. (now ditto); *C. hispida β aculeolata* (the specimen proved to be *C. vulgaris* L. f. *longibracteata* [Kg.] Mig.); *C. vulgaris* Ag. (now *C. vulgaris* L.); *C. fragilis* Desv. (now *C. globularis* Thuill., cf. Zaneveld 1940); *C. fragilis β capillacea* (now *C. globularis* Thuill. var. *capillacea* [Thuill.] Zanev.). The result of this publication is a sudden rise of the number of indigenous Charophyta, *N. mucronata β nidifica, N. syncarpa* and *C. fragilis* being additions to our flora. It is a lucky circumstance that most specimens mentioned by Miquel have been preserved and still can be studied.

Another investigator to whom the Netherlands' Algology is much indebted is again a medical man, R. B. van den Bosch (*1810, †1862), who lived at Goes (province of Zeeland). His first contribution to the algal flora appeared in 1846 and was concerning the flora of Zeeland. Three *Chara* species were mentioned, all of them previously known. In 1846 and 1848 Van den Bosch published two contributions to the algal flora of the Netherlands, both in "Nederlandsch Kruidkundig Archief", then the sole journal of the "Nederlandsche Botanische Vereeniging", *N. polysperma* (now *Tolypella intricata* [Trentep.] v. Leonh.), *Chara aspera* Willd., *C. polysperma* (now *C. vulgaris* L. f. *polysperma* [Kg.] Mig.), *C. vulgaris* L. f. *longibracteata* (Kg.) Mig. and *C. crinita* (now *C. canescens* Loisel.) being additions to our flora.

However, the most important contribution to the promotion of the knowledge of the Netherlands' Charophyta was furnished by Van den Bosch in his revision of this group in the "Prodromus Florae Batavae" of 1853 (Vol. II, pars 2). His study was based on the dried specimens extant in the various herbaria, and containing the localities already mentioned in the "Flora Belgii Septentrionalis" of 1840. In total, 6 species of *Nitella* and 8 of *Chara* are enumerated. Of these some were described as new, but they later on all proved to be identic with previously mentioned ones.

This work remained the leading one on our Charophyta during about ninety years. And, owing to its excellent qualities, the number of records could afterwards easily be increased.

A paper of minor importance is that by H. de Vries, "Flora van Nederland" (1870), in which the same species have been enumerated only, whereas no localities have been mentioned at all.

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[1] MIQUEL was the first to transfer *Chara mucronata* A. Br. to the genus *Nitella*; the specimen referred to is now identified as *N. flexilis* (L.) Ag.

3. Data from local floras. In the eighteenth century the number of this kind of floras is very much increased and, as has already been stated, they are of particular importance for the localities, whereas some of them are also recording new species.

In 1818, a flora of the vicinity of Leiden was published by Nicolaas Mulder, in which only *Chara vulgaris* L. is mentioned. The same species is quoted in the "Initia Florae Groninganae", published in 1825 by Stratingh, Westerhoff and Tresling, and, in 1826, in the flora of the neighbourhood of Breda, compiled by J. A. Kuyper van Wäschpenning.

In 1843 Gevers Deynoot's "Flora Rheno-Trajectina" appeared, which recorded *Nitella syncarpa* (Thuill.) Chev. and *Chara vulgaris* L.

In 1848, F. J. J. van Hoven describes in his "Flora van 's Hertogenbosch" three *Chara* species and one *Nitella,* viz. *N. translucens* (Pers.) Ag., which was new to our flora. The second edition of 1879 contains no additions to our Charophyta flora.

The contribution to the flora of the "Westland" in 1852 by J. E. van der Trappen, mentioning three, and the "Guide du Botaniste dans les environs de Maestricht", published in 1868 by Dumoulin, mentioning four species, only adding new localities.

In 1870, *Chara tenuispina* A. Br. and *C. connivens* A. Br. were added to the Netherlands' Charophyta flora, namely by Fr. Holkema in his splendid work "De plantengroei der Nederlandsche Noordzee-eilanden". This author did not find the genus *Nitella* represented in the Netherlands' Frisian islands. In the same paper *C. intermedia* A. Br. was described as new, but the species proved to be synonymous with *C. aculeolata* Kg. ap. Reichenb.

Reviewing the nineteenth century, we may state that the number of indigenous Charophyta species had greatly increased. Whereas at the beginning of this century four species (one of *Nitella*, three of *Chara*) were known, of which only two were definitely described as wild, the total number of species at the end of this century is three for *Nitella*, eight for *Chara* and two for *Tolypella.*

The number of localities of all species was much enlarged. The genera *Nitella* and *Chara* were definitely separated, and, though two species of *Tolypella* were known, that genus was not yet distinguished. Finally, there is a renewed progress in that Charophyta are again placed in the *Algae.*

IV. The XXth century.

As far as I know, in this century all papers on the Charophyta of the Netherlands were published in periodicals, but none of these appeared until more than 35 years had elapsed. In 1937, in "Nederlandsch Kruidkundig Archief", Miss K. J. Hocke Hoogenboom described the algal flora of the coasts of the IJselmeer, i.e. the Zuiderzee after it had been cut off from the Waddenzee by the big barrage dam in 1932. Before this time, according to Van Goor (1932), Charophyta were not at all present in this inland sea on account of the relatively high salinity. Three species were mentioned, one of which was new to our flora, but the plant referred to was not correctly identified and afterwards proved to be a form of *Tolypella glomerata* (Desv. ap. Loisel.) v. Leonh., which was not yet previously recorded either.

In 1938, H. D. Verdam published a list of the Charophyta collected up to that time in the Netherlands and·preserved in a number of herbaria, to which some particulars concerning the variability and distribution were added (Blumea III). However, no record was made of localities mentioned in papers earlier than the Prodromus of 1853. In this work, as well as in another one which was published in 1939 by the same author in our own language in "Nederlandsch Kruidkundig Archief", mention was made of 6 *Nitella*, 3 *Tolypella*, 1 *Nitellopsis* and 13 *Chara* species.

This local monograph is of much interest, as first of all four genera were distinguished, and secondly a number of species were added to the list of indigenous Charophyta. These newly recorded species are: *Nitella capillaris* (Krocker) J. Groves & Bull. Webst., *N. opaca* (Bruz.) Ag., *N. hyalina* (DC.) Ag., *Tolypella glomerata* (Desv. ap. Loisel.) v. Leonh., *Nitellopsis obtusa* (Desv. ap. Loisel.) J. Groves, *Chara contraria* A. Br. ex Kg., *C. baltica* Fr. ex Aspegr., *C. galioides* DC., *C. connivens* A. Br., and *C. verrucosa* Itzigs. (= *C. delicatula* Ag.). No more papers than these have been published in the 20th century.

It must be noted that none of the papers mentioned above give illustrations of our Charophyta, nor are these to be found in the splendid series of illustrations of indigenous plants, entitled "Flora Batava", which was started in 1800 and was continued until 1934.

Another remark may be added on the two oldest preserved specimens. These were both collected in 1829 by Van Hall near St Jacobi Parochie (province of Friesland) and were identified as *C. vulgaris* L. f. *longibracteata* (Kg.) Mig. (now ditto) and as *C. fragilis* Desv. f. *Hedwigii* (Ag.) Mig. (now to be named *C. globularis* Thuill. var. *Hedwigii* [Ag. ap. Bruz.] Zanev.). Both specimens are extant in the collections of the "Nederlandsche Botanische Vereeniging", preserved in the Rijksherbarium at Leiden.

In comparing Verdam's list with those of the surrounding countries, it is somewhat surprising that some species are lacking. Already, Braun & Nordstedt in their splendid monograph (1882), and Migula in his admirable work on the German Charophyta, both mention for our country i. a. *Chara Braunii* Gmel. and *C. rudis* (A. Br.) v. Leonh. However, no specimens of these species are extant in our herbaria, but it is very well possible that they some time will be rediscovered in the field. Other species which may be expected to be native in our country are: *Nitella mucronata* (A. Br.) Miq. (already mentioned in 1840, but this specimen proved to be *N. flexilis* [L.] Ag.), *N. gracilis* (Smith) Ag. and *N. tenuissima* (Desv.) Kg.

Thus, though many blanks have already been filled in, it must be admitted that in our country with its many waters, the distribution of most of the species has not yet been ascertained. May it be one of the primary algological objects to attain this end in the years to come!

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ON THE ASIATIC SPECIES OF NEUROPELTIS WALL. (CONVOLVULACEAE)

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(Issued June 15th, 1942).

In my first paper on Malaysian Convolvulaceae in Blumea III, 1938, p. 62—94, I pointed out (p. 83) that *Neuropeltis racemosa* Wall. has often been confounded both in literature and in herbaria with another species from the Malay Peninsula, *N. Maingayi* Peter. Moreover, on p. 85, I expressed my doubt whether specimens from Indo China, mentioned in literature as *N. racemosa* Wall. (by Gagnepain & Courchet in Lecomte, Flore Générale de l'Indo-Chine IV, 1915, p. 290, fig. 31) actually belong to that species. A more detailed study of materials from Indo China has now brought to light, that the plants from that country are different from those occurring in the Malay Peninsula and that they represent a new, though closely related, species.

Specimens from the west coast of British India (Kanara, Malabar) also appeared to be different from *N. racemosa*, under which name they are mentioned by Beddome, Clarke, Cooke and Gamble.

At present four species of *Neuropeltis* are known with certainty from Asia, to which perhaps may be added two other, doubtful ones. These four species are closely related to each other. As to their habit, the form of their leaves and their inflorescences they show a great mutual similarity. The fruits with the, at fruiting time, much enlarged bracts are also much alike in the four species and it is often difficult to keep them separate in the absence of well-developed flowers. These, however, show good specific differences and it is mainly on account of floral characteristics that the following key has been based. That the species are geographically well-limited is shown by *Fig. 1.*

The materials examined by me, belong to the following herbaria:

(B) — Berlin-Dahlem.
(BR) — Brussels.
(K) — Kew.
(L) — Leiden.
(P) — Paris.
(PNH) — Manila.
(SING) — Singapore.
(U) — Utrecht.

Key to the Asiatic species of Neuropeltis.

1a. Corolla tube inside hairy at the base of the filaments. Styles as long as or shorter than the breadth of a stigma. Tenasserim, N.W. part of the Malay Peninsula . . . . **1. N. racemosa**

b. Corolla tube inside glabrous at the base of the filaments. Styles much longer than the breadth of a stigma 2

2a. Bract of well-developed flowers broad-elliptic, at least 5 mm long, minutely mucronate. Filaments incurved. Leaves acuminate, with a long and narrow acumen, young ones densely tomentose above. British India (Deccan Peninsula). **4. N. malabarica**

b. Bract of well-developed flowers mostly smaller, mucro conspicuous. Filaments straight. Acumen of the leaf blade not so long and narrow; young leaves not densely tomentose above 3

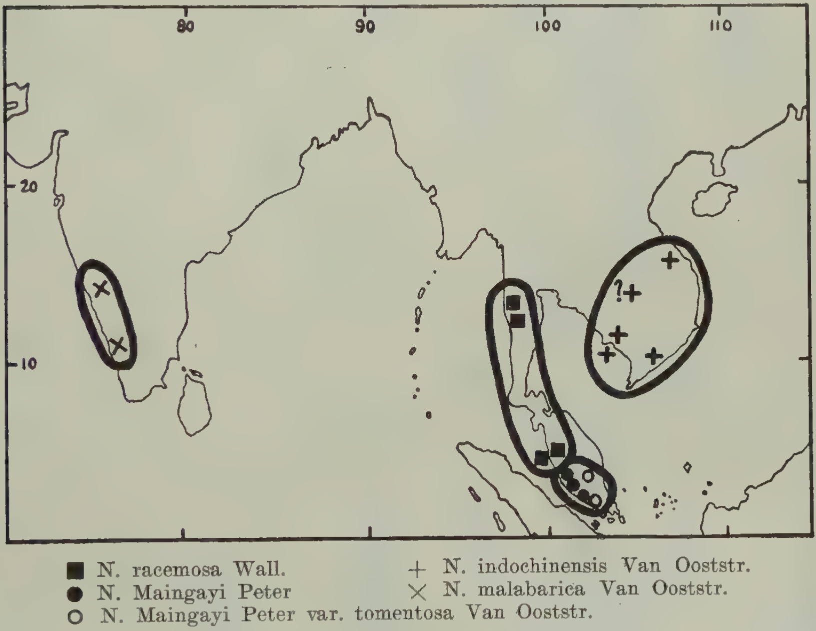
80
90
100
110
20
10
?
■ N. racemosa Wall.
● N. Maingayi Peter
○ N. Maingayi Peter var. tomentosa Van Ooststr.
+ N. indochinensis Van Ooststr.
× N. malabarica Van Ooststr.

Fig. 1. — The distribution of the Asiatic species of *Neuropeltis* Wall.

3a. Styles long, filiform, erect, 2½—3 times as long as the breadth of a stigma. Corolla campanulate to rotate, the lobes elliptic-oblong. Indo China **3. N. indochinensis**

b. Styles shorter, divaricate, 1½—2 times as long as the breadth of a stigma. Corolla more rotate, the lobes broader, ovate. Malay Peninsula . . . . **2. N. Maingayi**

1. Neuropeltis racemosa Wall. in Roxb., Fl. Ind., ed. Carey & Wall., II (1824) p. 44; Van Ooststr. in Blumea III (1938) p. 81 — *? N. intermedia* Griff., Notul. Pl. Asiat. IV (1854) p. 285 — *Fig. 2, a—b.*

Distribution: Tenasserim, N.W. part of the Malay Peninsula, ? Borneo (see Blumea l. c. p. 83).

Tenasserim: without exact locality, *Helfer, Herb. of the late East India Company 5887* (K); *Falconer 1032 bis* (K); Mergui, *Griffith, Herb. of the late East India Company 5887* (K).

Malay Peninsula: Kedah and P. Penang (see Blumea l. c., p. 82).

The type of *N. intermedia* Griff. is unknown to me. Its description very well agrees with that of *N. racemosa* Wall. and I suppose that the two species are identic.

2. **Neuropeltis Maingayi** Peter ex Van Ooststr. in Blumea III (1938) p. 83 — *Fig. 2, c—d.*

Distribution: Malay Peninsula.

Malay Peninsula: Perak, Selangor and Malacca (see Blumea l. c., p. 84).

var. **tomentosa** Van Ooststr. in Blumea III (1938) p. 85.

Distribution: Malay Peninsula.

Malay Peninsula: Malacca and Pahang (see Blumea l. c., p. 85).

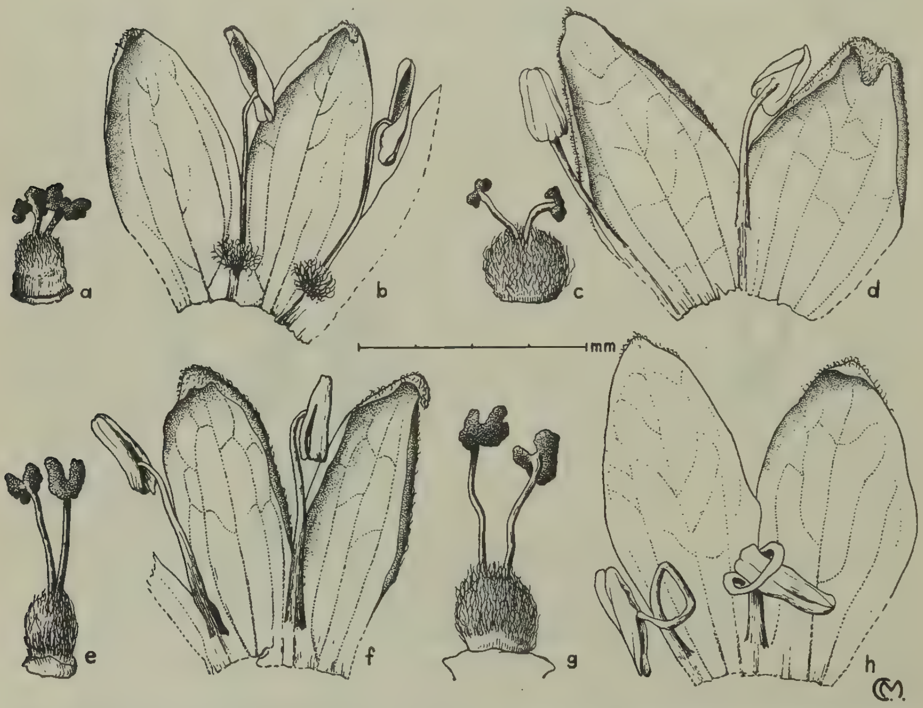

Fig. 2, *a—b*: *Neuropeltis racemosa* Wall., *a*: pistil, *b*: part of corolla with stamens; *c—d*: *N. Maingayi* Peter, *c*: pistil, *d*: part of corolla with stamens; *e—f*: *N. indochinensis* Van Ooststr., *e*: pistil, *f*: part of corolla with stamens; *g—h*: *N. malabarica* Van Ooststr., *g*: pistil, *h*: part of corolla with stamens.

3. **Neuropeltis indochinensis** Van Ooststr., nov. spec. — *N. racemosa* auct.; Gagnep. & Courchet in Lec., Fl. Gén. Indo-Chine IV (1915) p. 290, fig. 31, non Wall. — *Fig. 2, e—f.*

Description of the type collection, *Pierre s. n.*, from the island of Phu-quoc (the data in parentheses refer to the other specimens mentioned below; the description of the fruit and the bract at fruiting time has been made after the specimens *Pierre 1464* and *Pierre s. n.* from the Cam Chay mountains).

Frutex scandens, rami teretes, in partibus junioribus tomentulosi, in partibus adultioribus glabrescentes vel glabri, ad 3½ (—6) mm diam., cinereo-brunnei vel cinerei, juniores lenticellis punctiformibus numerosis pallidis praediti. *Folia* anguste ovata, ovato-oblonga vel oblonga, interdum lanceolata, apicem versus gradatim attenuata vel acuminata, apice acuta vel obtusa, mucronulata, mucrone 1—1½ mm longo, basi obtusa (vel acutiuscula), 6—10 (—15) cm longa, 2—4½ (—6) cm lata, tenuiter coriacea, supra primo breviter adpresseque pilosa (vel subglabra), deinde glabrescentia, subtus minus pilosa, deinde glabrescentia; nervus medianus supra impressus, subtus prominens, nervi laterales primarii utrinque 7—9, prope marginem arcuato-conjuncti, supra subprominentes et saepe canaliculati, subtus prominentes; nervi minores reticulati, supra plus minusve prominuli, subtus minus prominuli sed conspicui; petiolus ½—1 (—1½) cm longus, breviter adpresseque pilosus, glabrescens, supra sulco longitudinali praeditus. *Inflorescentiae* in axillis foliorum solitariae vel binae, racemosae, ferrugineo-tomentosae, foliis breviores vel aequales, 3—8 (—18) cm longae; pedicelli breves, 2 mm longi; bracteae in pedicello infra calycem ipsum insertae, basi pedicello adnatae, ovatae vel ellipticae, mucronatae, 2—2½ mm longae, in fructu valde auctae, late ovatae vel ellipticae, scariosae, reticulato-nervosae, utrinque breviter adpresseque pilosae, apice obtusae vel interdum subemarginatae, mucronulatae, basi subcordatae, 2½—4 cm longae, 2—3 cm latae, paullo infra medium fructum gerentes; bracteolae minutae. *Sepala* 5 imbricata, extus tomentosa, intus glabra, exteriora dua elliptica, obtusa, 2½ mm longa, sepalum tertium orbiculare, margine unilateraliter glabrum, 2¼ mm longum, interiora dua orbicularia, marginibus glabris, ± 2 mm longa. *Corolla* late campanulata vel rotata, ± 5½ mm longa, profunde 5-lobata, lobi quam tubus longiores, elliptico-oblongi, ± 4 mm longi, ± 2¼ mm lati, primo apice marginibusque inflexi, ultimatim plani, nervosi, extus pilosi; tubus intus ad basin filamentorum glaber. *Stamina* paullo infra sinus corollae inserta, quam lobi corollae breviora, filamentis filiformibus, antheris oblongis basi sagittatis. *Ovarium* ovoideum, pilosum, ± 1½ mm altum; styli 2, filiformes, quam ovarium valde longiores, 2—2½ mm longi, longitudine circiter 2½—3-plo latitudinem stigmatis aequante, stigmata ± ¾ mm lata, forma vestigii equi, obscure lobata. *Capsula* subglobosa, 5—6 mm alta, 4-valvata, 1-locularis, semine unico, globoso, laevi, ± 4 mm diam., nigro.

Vernacular name: Cây ca giang (Gagnepain & Courchet, l. c., p. 292).

Distribution: Indo China.

Indo China: Cambodia, island of Phu-quoc in the gulf of Siam, *Pierre s. n.*, fl. Febr. 1874 (K; P, *type*; PNH); Cam Chay mountains near Kampot, *Pierre 1464*, fr. Apr. 1874 (P); id., *Pierre s. n.*, fr. Apr. 1874 (BR, K, P, PNH); Cochin China, Bien-hoa, *Thorel 629*, with young flowers and with very young fruits (K, P); Annam, Tourane and vicinity, in thicket near stream, *J. & M. S. Clemens 4175*, fr. May—July 1927 (K, U); Laos, Mulu-prey, *Harmand 218*, fr. (BR); id., *Harmand 271*, fr. Jan. 1876 (P).

Only the type specimen in the Paris herbarium has well-developed flowers, another sheet of the type collection at Manila as well as that at Kew only bears flower buds and so do the specimens at Kew and Paris collected by Thorel (n. 629). The Thorel specimen at Paris has been used

by Gagnepain and Courchet for their figure in the Flore Générale de l'Indo-Chine. This figure shows a very young flower, in which the corolla lobes, the stamens and the styles have not yet reached their full length. As to the form of the leaves the Thorel specimen at Paris agrees with the type of *N. indochinensis*; the same number at Kew, however, has the leaves much narrower, elliptic-oblong with acute tip and base.

I am not quite certain that the fruiting specimens collected by Harmand actually belong to *N. indochinensis.* The Harmand collection has leaves of a somewhat aberrant form, they are broad-elliptic (6—9 cm × 4—6 cm) and their minute reticulate nervation is less prominent above.

4. **Neuropeltis malabarica** Van Ooststr., nov. spec. — *N. racemosa* auct.; Beddome, Ic. Plant. Ind. Orient. I (1874) p. 68, t. CCXCI; Clarke in Hook., Fl. Brit. Ind. IV (1883) p. 225, p.p.; Cooke, Fl. Pres. Bombay II (1905) p. 227; Gamble, Fl. Pres. Madras V (1923) p. 922, non Wall. — *Fig. 2, g—h.*

Description of the type specimen, *Beddome 326* (the data in parentheses refer to the specimen *Talbot 2735,* mentioned below).

Frutex scandens, rami teretes, in partibus junioribus ferrugineo-tomentosi, denique glabri, ad 3½ mm diam., cinerei (vel fusci), lenticellis sparsis pallidis praediti. *Folia* elliptico-oblonga (vel elliptica vel ovata), apice acumine longo angusto acuminata, basi acuta, ad 10 (—12) cm longa, ad 4 (—5) cm lata, tenuiter coriacea, supra primo dense ferrugineo-tomentosa, denique glabra, subtus valde minus pilosa, denique glabra; nervus medianus supra impressus, subtus prominens, nervi laterales primarii utrinque 7—9 (—10), prope marginem arcuato-conjuncti, supra subprominentes, canaliculati, subtus prominentes, nervi minores reticulati utrinque prominuli; petiolus 1—1¼ cm longus, primo dense ferrugineo-tomentosus, ultimatim glaber, supra sulco longitudinali praeditus. *Inflorescentiae* in axillis foliorum vel e ramis defoliatis ortae, solitariae vel binae, racemosae, ferrugineo-tomentosae, 4—9 cm longae; pedicelli breves, ad 5 mm longi; bracteae in pedicello paullo infra calycem insertae, basi pedicello adnatae, late ellipticae, mucronulatae, in florescentia 5 (—8) mm longae (in fructescentia valde auctae, utrinque tomentosae). *Sepala* imbricata, extus tomentosa, intus glabra, exteriora dua elliptica, acutiuscula, 2½ mm longa, sepalum tertium orbiculare, margine unilateraliter glabrum, 2½ mm longum, interiora dua transverso-elliptica, marginibus glabris, 2¼—2½ mm longa. *Corolla* late campanulata vel rotata, ± 6½ mm longa, profunde 5-lobata, lobi tubo paullo longiores, subovati, obtusi, ± 3½ mm longi, nervosi, extus adpresse pilosi; tubus intus ad basin filamentorum glaber. *Stamina* paullo infra sinus corollae inserta, lobis corollae breviores, filamentis incurvatis, filiformibus, antheris oblongis basi sagittatis. *Ovarium* subglobosum, pilosum, ± 1½ mm altum; styli 2, filiformes, quam ovarium valde longiores, 2½ mm longi, longitudine circiter 2½—3-plo latitudinem stigmatis aequante, stigmata ± ¾ mm lata, forma vestigii equi, obscure lobata. *Capsula* mihi ignota.

Distribution: British India (Deccan Peninsula).

British India (Deccan Peninsula): near the foot of the Tambacherry ghat in the plains of Malabar, about Poodoopara (according to Beddome l. c.; the type specimen bears no indication of the collecting locality), *Beddome 326,* fl. Oct. 1873

(K, *type*); N. Kanara, Potoli (Cooke l. c. writes Potelli), *Talbot 2735*, fl. and young fr. Febr. 1892 (K).

This species shows a remarkable dense tomentum on the upper surface of the young leaves. Moreover, it is characterized by the size of the bracts, which at flowering time are larger than in the other species and not so distinctly mucronate.

Doubtful species.

Neuropeltis ovata Wall., Cat. (1828) n. 1323, nomen.

The type collection of Wallich's *N. ovata*, from Amherst, Tenasserim, is represented in several herbaria (B, K, P, SING) by leafy branches with mature fruits or by fruits only. The leaves are fully identic with those of *N. racemosa* Wall.; the form of the large elliptic scarious bract is slightly different from what is commonly found in that species. In *N. racemosa* Wall. the bract is, at fruiting time, broad-elliptic to orbicular, slightly emarginate and minutely mucronate at the apex, slightly emarginate or obtuse at the base, bearing the fruit a little below its centre. In the specimens of *N. ovata* the bract is narrower, elliptic, and rounded both at the apex and at the base. As the form of the bract appears to be rather variable in various species of *Neuropeltis* it is quite possible that the plant from Amherst belongs to *N. racemosa*. Without any knowledge of its flowers it is, however, impossible, to solve this question definitely.

Neuropeltis bracteata Griff., Notul. Pl. Asiat. IV (1854) p. 285.

In my paper on the Convolvulaceae of Malaysia I (Blumea III, 1938, p. 81) I mentioned this name as a synonym under *N. racemosa* Wall. with the addition of a note of interrogation. As the type of Griffith is unknown to me, it is still impossible to clear up this synonymy. Griffith did not know the fruits of his species nor did he see the styles, but as he describes the plant with flowers which are adnate to their bracts, his insertion of it in *Neuropeltis* is probably right. The sepals are described as lanceolate, which makes it, however, uncertain that the species is identic with *N. racemosa* Wall. The existence of bundles of hairs at the base of the filaments, it has, on the other hand, in common with the latter species.

SOME NEW SPECIES OF AXONOPUS (GRAMINEAE).

BY

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(Rijksherbarium, Leiden)

(Issued June 15th, 1942).

During the preparation of an account of the grasses for the flora of Dutch Guiana many difficulties were found in the identification of species of the genus *Axonopus*. Our knowledge as to the most recent treatment is entirely based upon Doell's work for the Flora Brasiliensis. It is, however, evident that Doell did not see many types and his concept of many species proves to be incorrect. The modern genus *Axonopus* is not accepted by Doell but treated by him as a section *Emprosthion* of the large genus *Paspalum*. The difficulties arose already when he treated Fluegge's *Paspalum furcatum* which is a continental North American species. Raddi's *Paspalum obtusifolium* from Brazil, although given as a synonym, is a quite distinct species. As another synonym is mentioned by Doell in Fl. Bras., Vol. II, pars II, p. 103: *Panicum surinamense* Hochstetter in Hostm. et Kappler, Plant. Surinam. n. 1283 with the addition: "spiculis ad margines, imprimis basi, magis pilosis". The correct citation of *Panicum surinamense* Hochst. is, however, given by Steudel in his Synopsis, where the species is published. The type of Steudel was certainly not seen by Doell, but the valid publication of the year 1854 was mentioned by Doell under *Paspalum scoparium* Fluegge with the same number 1283 and the addition "partis nomine". I observe here that the synonyms under *Paspalum scoparium* Fluegge in Doell's treatment are for the greater part wrongly placed. It may be that Doell saw different plants of Hostmann and Kappler's number 1283, but the type of Steudel corresponds to only one definite species, correctly described by him.

From the description it is evident that Steudel's plant is neither *Paspalum furcatum* nor *Paspalum scoparium*. To demonstrate this we have but to compare the description from the year 1854 which runs as follows:

Panicum surinamense Hochst. (Hrbr. Dr. Hostmann nr. 1283) Erectum; culmo firmo valido elato (abscisso 3-pedali); vaginis longissimis basi cum nodis dense molliterque sursum ad vaginas tantum pilosis; foliis linearibus compressis (1′ longis in statu explanato 4—5‴ latis) glabris carina scabriusculis; racemis elongatis (6—9″) longis strictis fasciculatis (6—8); spiculis solitariis 1½-linealibus subsessilibus alternis subimbricatis lanceolatis glabris; gluma inferiore vix ulla (nisi apex explanatus pedicelli brevissimi), superiore 3-nervia flosculum aequante. Surinam.

This description is clear and corresponds to a distinct species which is a member of the modern genus *Axonopus.*

The actual type (*Hostmann No. 1283*) was not seen by me but I was so fortunate as to find a good duplicate of this important plant at the Herbarium of Utrecht with Hostmann's number 1283, attached to the specimen. This specimen perfectly agrees with Steudel's description cited above. I could compare this specimen also with an authentic specimen of *Paspalum leptostachyus* H. B. K. in the Herbarium of Willdenow at Berlin in Willdenow's cover No. 1587. This is a distinct species, *Axonopus leptostachyus* (Fluegge) Hitchc. and different from Steudel's *Panicum surinamense*; the latter is a species of *Axonopus* and being valid, is transferred by me to that genus as **Axonopus surinamensis** (Hochst.) Henr., nov. comb., based upon Steudel's *Panicum (Digitaria) surinamense.*

It is noteworthy that the taxonomical characters in the genus *Axonopus*, applied to separate the various species are different from those generally used in the allied genus *Digitaria.* In *Digitaria* there are great differences in the characters of the spikelets, whereas the vegetative parts present but few characters to separate the species. In *Axonopus*, however, the general form of the spikelets is often nearly the same in allied species, whereas there are great differences in the vegetative parts. This is the reason why the genus *Axonopus* is readily recognizable, even at once, when there are spikelets at our disposal. *Axonopus surinamensis* is most allied to *Axonopus leptostachyus* (Fluegge) Hitchc. Both species have but few very long racemes, placed solitary along a common axis. In *Axonopus leptostachyus* the spikelets are smaller (about 2½ mm) and the fruits are darker, more obovate and less hairy at their summit. In *Axonopus surinamensis* the spikelets are larger (3½ mm), the fruit is more ovate, pale yellowish and more densily hairy at the summit. On account of the differences mentioned above, the two species are accepted as distinct, although they are closely allied. The specimen of *Axonopus leptostachyus* in Willdenow's Herbarium is probably not the actual type of Fluegge, it is at present a most valuable specimen, being received from Humboldt, the more so since Humboldt's plant, described by Fluegge, could not be located.

Willdenow's plant agrees with the description of Fluegge in the year 1810 and also with Humboldt's own description in the Nova Genera from the year 1815. *Axonopus leptostachyus* was mentioned by Hitchcock in his work on the grasses of British Guiana as found along the Mazaruni and the Essequibo River near Bartica. I saw both numbers 17114 and 17264 collected by him. The first one is a more depauperate plant with shorter, only about 12 cm long racemes, the other number is more robust and bears 25 cm long racemes. Steudel's duplicate type has at least 20 cm long racemes and Hitchcock No. 17264 therefore agrees better with this plant. Both numbers have, moreover, the same large 3½ mm long spikelets. Hitchcock's identification is wrong and his specimens, so far as I saw them, belong to *Axonopus surinamensis* (Hochst.) Henr. All specimens identified by me as *Axonopus surinamensis* have densely adpressed sericeous nodes.

Another species of this group is **Axonopus longispica** (Doell) Henr., nov. comb., based upon *Paspalum longispica* Doell as described in the Flora Brasiliensis. This species has also but few racemes but differs by the glabrous nodes. We can distinguish a number of other species by their great number of racemes of the inflorescence. In these cases the racemes are not placed solitary along the axis but each raceme, at least the lower ones in each panicle, is divided nearly from the base into many other ones of nearly equal length, giving the panicle a more dense aspect.

A new interesting species of this group is

Axonopus gentilis Henr., nov. spec. — Perennis, caespitosa; culmi erecti, elati, robusti, teretes, cum paniculis usque ad 1.5 m vel plus alti, glabri, striati, multinodes, nodis minute adpresse puberulis, inferioribus vaginis obtectis, superioribus nudis; vaginae arctae internodiis longiores, haud carinatae, striatae, scaberulae, superne, praesertim ad margines hirsutulae; laminae planae, ad 1 cm vel paulo plus latae, firmae, valde elongatae, sensim acuminatae, scabrae, nervo medio crasso praeditae, subtus inter nervis albo-lanuginosae, basi marginibus longiter hirsutae, macula triangularis praeditae, 50 cm vel plus longae, ligula brevis sed longe niveo-barbata; inflorescentia elongata, angusta, 30 cm vel plus longa, basi cuneata, racemis pluribus elongatis usque ad 15 cm longis formata, axis communis striatus, scaberulus, racemi filiformes, triangulares, dense spiculati, in axillis haud barbatis, leviter puberuli tantum, marginibus serrulatis, quasi singuli, sed a basi divisi; spiculae minute pedicellatae, quasi sessiles, glaberrimae, pusillae, ellipticae, 1.7 mm longae; gluma II, lemma sterilis et fertilis aequilongae, gluma II et lemma sterilis ambae 5-nerves, hyalinae, lemma fructifera coriacea, albidula, punctulato-scaberula.

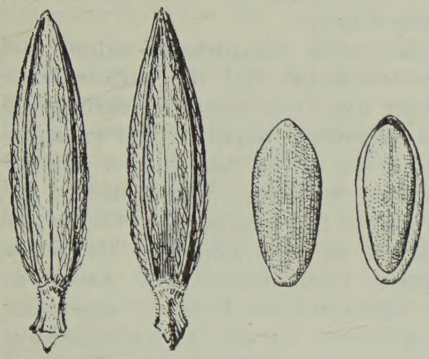
Expeditio ad fines Surinamensi-Brasilienses designandos. Iter I. Upper Sipaliwini, Camp IV, savannah, 2°N. lat., 56°W. long., leg. *H. E. Rombouts*, 23 Oct. 1935. *No. 203 Typus* (Herb. Leiden, dupl. Herb. Utr.).

This species is distinguished by its very robust form and by the very small spikelets, the equal outer scales not protruding above the fruit.

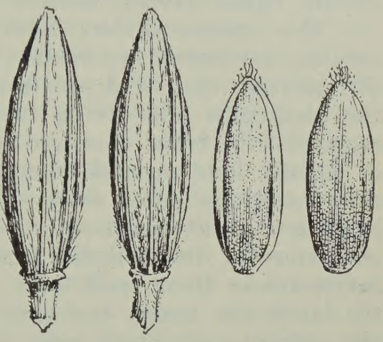
Another robust species from the same locality is

Axonopus pubivaginatus Henr., nov. spec. — Perennis, caespitosa, culmi elati, robusti, valde compressi, paucinodes, internodiis elongatis, nodis constrictis dense sericeo-barbatis, vaginae compressae, carinatae, equitantes, inferne glabrescentes, superne et ad margines pubescento-hirsutae, pilis basi tuberculatis; laminae carinato-complicatae, superne planae, basi collo dense hirsuto a vagina separatae, explanatae ad 1 cm vel plus latae, valde elongatae sensim acuminatae, scabrae, pilis paucis adspersae, ligula brevissima, barbata; inflorescentia exserta, 20 cm vel paulo plus longae, flabellata, cuneata, axis communis albreviatus, ca 5 cm longus, angulatus, striatus, scaberulus, racemi in axillis puberuli tantum, quasi singuli, sed ad basi in ramulis pluribus aequilongis divisi, racemi triangulares, marginibus scaberulo-serratis; spiculae elliptico-oblongae, superne distincte acuminatae, brevissime pedicellatae, 3 mm longae, puberulae, gluma sterilis et lemma sterilis aequilongae, circa 5-nervis, nervis prominentibus, interstitia adpresse pubescentes, lemma fertilis lanceolata, brevior, superne pilis albis praedita, coriacea, leviter striolato-punctata, albidula.

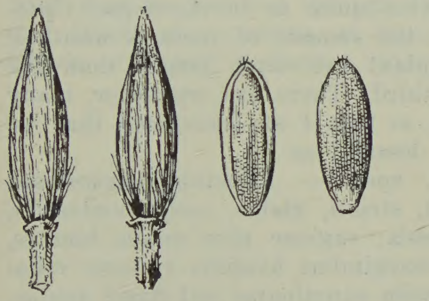
Expeditio ad fines Surinamensi-Brasilienses designandos. Iter I.



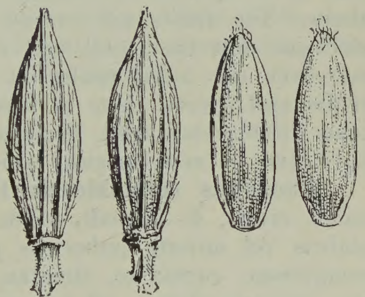
Axonopus columbiensis, nov. spec. —
From type specimen — × 10.



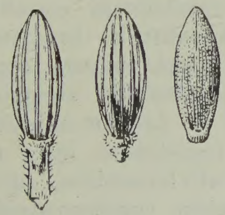
Axonopus surinamensis (Hochst.) Henr. —
From Hostmann No. 1283 — × 10.



Axonopus leptostachyus (Fluegge)
Hitchc. — From type specimen — × 10.



Axonopus pubivaginatus, nov. spec. —
From type specimen — × 10.



Axonopus gentilis, nov. spec. —
From type specimen — × 10.

Upper Sipaliwini, Camp B, leg. *H. E. Rombouts,* 20 Jan. 1936. *No. 395 H, Typus* (Herb. Leiden, dupl. Herb. Utr.).

This species differs especially in the much compressed culms and sheaths, the culms are robust but rather few-noded and the inflorescence differs from that of *A. gentilis* in the short axis, the racemes overtopping the main axis and giving the panicle a flabellate aspect. The racemes, especially the lower ones, are once more divided to the base into a number of equally long racemes, simulating secondary panicles. The spikelets are acuminate, the outer scales protruding above the fruits and the latter have a distinct short tuft of white hairs at the summit. In many characters of the spikelets there is a great resemblance with *Axonopus surinamensis* Henr. and with *Axonopus leptostachyus* Hitchc.; especially the latter has nearly the same form of spikelets, but in *A. leptostachyus* the spikelets are more hairy at the base and the fruit is more obovate and broadest above. Both *A. surinamensis* and *A. leptostachyus* have, however, very long solitary racemes.

Another species with solitary racemes was formerly identified for me by Prof. Hitchcock as belonging to *Axonopus leptostachyus* Hitchc. Even a superficial glance at the spikelets, however, proved that there are important differences with that species, when I compared it with the specimen in Willdenow's Herbarium at Berlin, the specimen mentioned by me above. The fruits are indeed more obovate quite as in *Axonopus leptostachyus*, but the small tuft of hairs at the summit of them is wanting, moreover the outer scales in the new plant are much longer than the fruits and exceed them at least by one third. There are, moreover, many other differences with Fluegge's species, so that I am convinced that we have here a new species, which I will describe as

Axonopus columbiensis Henr., nov. spec. — Perennis, caespitosa; culmi erecti, 4—5 nodi, valde compressi, striati, glabri, nodis contractis, glabris vel minute puberulis pilis adpressis; vaginae plus minus hiantes, compressae, carinatae, striatae, glabrae, marginibus hyalinis superne ciliatis; laminae planae, ad 1.5 cm latae, sensim acuminatae sed haud acutae, hinc inde pilis sparsis praeditae, nervo mediano crassiusculo, nervis secundariis 10—12 percursae, ad 20 cm vel paulo plus longae, haud rigidae, viridulae, collo obliquo hirsuto a vagina separatae, ligula longe pilosa, pedunculus inflorescentiae gracilis, panicula terminalis e racemis circa 5 composita, axis communis abbreviatus, circa 3 cm longus, racemi laxi, elegantes, ad 14 cm longi, racemi secundarii laterales e nodis fere omnibus erumpentes vel inter vaginas occulti, e ramis paucis, vulgo 2 compositi, axis partialis racemorum equaliter spiculatus, applanatus, distincte marginatus, spiculis solitariis breviter pedicellatis, pedicelli triquetri, puberuli; spiculae 3.5 mm longae, regulariter lanceolato-oblongae vel elliptico-oblongae, haud acuminatae, stramineo-viridulae, gluma sterilis et lemma sterilis aequilongae vel tantum minutissime inaequilongae, nervis 5 percursae, nervo mediano indistincto, inter nervos seriatim pubescentes, lemma fertilis anguste obovato-lanceolata, apice haud barbulata, 2 mm tantum longa, albidula, seriatim ruguloso-striolata.

Columbia: Santa Marta, leg. *H. H. Smith* (1898—1901) *No. 183, Typus* speciei in Herb. Lugd. Bat. sub. No. 921.5—208.

Beside the differences already mentioned above, this species is characterized by the many reduced lateral inflorescences from nearly all the nodes and by the pale greenish colour of the leaves. In the vegetative parts there is some resemblance with the very common *Axonopus compressus* (Sw.) P. B. especially as to the broad leaves and the lateral panicles included in the sheaths, but this common species is not caespitose. The spikelets are given by Hitchcock as about 2 mm long, the glume and the sterile lemma equaling the fruit or pointed beyond it. In a plate on p. 574 of his Manual, he pictures a stoloniferous plant, creeping and rooting at the nodes, the various characters of the spikelets of which are, however, in contradiction with the common idea of the typical plant as indeed the outer scales are figured as being of but equal length to the fruit. This concept of Hitchcock is again mentioned in Hitchcock's last treatment of the grasses of the West-Indies, where also the same figure is given, but in the description the spikelets are mentioned as being 2 to 3 mm long. Hitchcock observes that the species is exceedingly variable in habit, but from material at hand it is evident that two different species are mixed together in what generally is named *Axonopus compressus* P. B. The true *A. compressus,* variable as the species may be, has always spikelets where the outer scales are much protruding above the fruit, as is always very evident in dried material where the fruit may be observed through the pressed outer scales. Thus, it is clear that Hitchcock's opinion, at least as to his figures, is unacceptable. The figures represent a distinct, though closely allied species.

Errata, BLUMEA V, No. 1.

p. 57, l. 11 from bottom, instead of: fig. 4, read: fig. 5
footnote, l. 1, „ „ : needs, „ : need
„ 59, l. 5 from bottom, „ „ : cases, „ : the cases
„ 64, „ 2 „ top, „ „ : show, „ : shows
„ 83, „ 7 „ bottom, „ „ : ontegenetic, read: ontogenetic.
„ 107, Loc. 7, l. 2
„ 108, l. 15
„ 109, „ 16 } „ „ : *sizyphoides*, read: *zizyphoides*.
„ 110, Loc. 4, l. 16
„ 123, l. 23
„ 124—125, Table III, footnote 1, after: column II, add: (nrs. 1—42)
„ 131, l. 7—8 from top
„ 24 „ „ } instead of: signification, read: significance
„ 24 „ „ „ „ : contradiction, read: contra-distinction
„ 132, „ 8 „ „, „ „ : significations, read: significances
„ 142, „ 26 „ „, „ „ : centainly, read: certainly
„ 148, „ 1 „ „, „ „ : those, read: that

„ 18, Fig. 5, bottom line, „ „ : it, read: is
„ 94, Fig. 1, Loc. 5, l. 2, „ „ : secondary, read: sedimentary
„ 162, l. 1 from top, „ „ : **Brownei**, read: **Brownii**